REPORT OF THE COKE-OVEN PROJECTS ENQUIRY COMMITTEE

GOVERNMENT OF INDIA
PLANNING COMMISSION

सत्यमेव जयते

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SECTION I

INTRODUCTION

History of the Durgapur Project and the appointment of the Committee

The Government of West Bengal, on examination of the several possibilities for providing increasing opportunities for employment within the State, visualised the establishment at Durgapur of a Coke-oven Plant equipped for the recovery of various by-products therefrom and by 1953 obtained a preliminary report from Dr. C. Otto & Comp. of Germany. This proposal also contemplated the construction of a gas pipe line from Durgapur to Calcutta for supplying gas for industrial and domestic purposes at reasonable prices at Calcutta and other places. The by-product recovery and processing plants planned along with the coke-ovens have been regarded by the State Government as the nucleus of a coal-based chemical industry. On the basis of the project report, the West Bengal Government referred to the Planning Commission in September 1953, their Durgapur Scheme, consisting of (i) a coke-oven plant for a coal throughput of 1300 tons a day, benzol rectification and tar distillation plants and (ii) a gas grid supply with a compressor station and gas holders and a grid gas main of a length of 130 miles to Calcutta.* Arrangements for the recovery of sulphur from the coke-oven gas had also been visualised as part of the project. The coke-oven plant was then estimated to recover 850 tons of coke, 45 tons of crude tar, 12 tons of ammonium sulphate, 16 tons of benzol, 3·5 tons of sulphur and make available 9·5 million c.ft. of coke-oven gas for the gas grid. In March 1954, as desired by the West Bengal Government, a sum of Rs. 17 lakhs was made available in the form of foreign exchange for obtaining project reports and specifications from Dr. C. Otto & Comp. for a Coke-oven Plant and Gas Grid and for a power plant of 60,000 kW which was also envisaged as an additional item in the project. After some correspondence between the State Government and the Planning Commission and a Conference with the representatives of the State Government on 30th August, 1954, the Planning Commission came to the conclusion that a study into the various aspects of the project was necessary, against the background of the current demand and the growth of demand during the period of the Second Five-year Plan for coke and related by-products of the Coal Tar Distillation Industry. Accordingly, they appointed a Coke Oven Projects Enquiry Committee with the following personnel and terms of reference (*vide*: Resolution in the Gazette of India of 27th November, 1954).

2. Personnel of the Committee

Chairman

Shri Darab C. Driver, President, Coal Consumers' Association of India, Calcutta.

Members

Shri R. K. Ramadhyani, I.C.S., Coal Commissioner;

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* The latest assessment of the W. Bengal Government places the length of the gas grid from Durgapur at 103 miles to Calcutta and 41 miles to Chittaranjan.

Dr. A. Nagaraja Rao, Chief Industrial Adviser, Ministry of Commerce and Industry;

Shri C. S. N. Raju, Chief Engineer, Central Water and Power Commission;

Shri S. V. Aiyer, Chief Cost Accounts Officer, Ministry of Finance;

Shri S. N. Ray, I.C.S., Chief Secretary, Government of West Bengal.

Secretary

Shri K. Vyasulu, Assistant Chief (Industry, Trade & Communication Division), Planning Commission.

3. Terms of Reference

(i) To make an assessment of the demand for coke as at present and over the next Five Year Plan period;

(ii) To examine the replacement and expansion programme of existing producers of coke in the country and assess the additional production likely to be available from existing and projected cokeries;

(iii) In case the need for additional coke production is established, to advise on the exact quantum of development and the size of the plant or plants that will have to be established, and on their appropriate locations and in this connection to make an appraisal of the economics of the West Bengal Government scheme referred to in para. 1 taking into account the scope for utilisation of by-products dealt with in (iv), (v) and (vi) below;

(iv) To examine the prospects of by-product recovery and coal-tar distillation plants, against the demand, current and expected during the Second Five-year Plan, for the primary organic chemicals obtained as by-products directly from coke-oven gas or from distillation of coal-tar;

(v) To examine the scope for and economics of a thermal power plant as an adjunct to a coke-oven plant, if established at Durgapur taking into consideration the power generation programme of the Damodar Valley Corporation and the anticipated growth of load for electric power in the Bengal-Bihar areas;

(vi) To examine other possibilities of utilising coke-oven gas in the vicinity of a coke-oven plant if established at Durgapur for improving the economics of operation of the coke-oven plant;

(vii) To advise on the best method of organisation and management of any independent coke-oven plant or plants and ancillary industries that might be recommended to be established in the public sector.

4. The Committee should make its assessment of the economics of coke-oven plants in the public sector as though they were commercial undertakings with liability to make provision for Central and local taxation.

Plan and Progress of the Working of the Committee

5. The Coke Oven Projects Enquiry Committee held the first meeting on 10th December, 1954, within a fortnight of their appointment at which were finalised the questionnaire and letters to be issued to Associations of Industry, Industrial Units, Departments of Central and State Governments and statutory bodies like the Damodar Valley Corporation, etc., with a view to obtaining information on the various issues connected with the enquiry. Appendix A contains the list of various bodies who were addressed by the Committee in connection with the enquiry.

6. Further meetings were held as indicated below:

Second Meeting . . .	Calcutta .	12-2-,55 & 14-2-,55
Third Meeting . . .	Calcutta .	5-3-,55 & 7-3-,55
Fourth Meeting . . .	Calcutta .	26-3-,55 to 28-3-,55 & 30-3-,55
Fifth Meeting . . .	Calcutta .	11-4-,55 & 12-4-,55
Sixth Meeting . . .	Calcutta .	2-5-,55

7. In the course of working, the paucity of published data, particularly in respect of the widely dispersed foundry industry, proved to be a serious difficulty which the Committee had to face. The response to the questionnaire from this sector was inadequate and the Committee had to make separate assessment of foundry demands on the basis of certain assumptions on the lines of the replies received from several allied bodies and individuals.

8. Shri N. N. Majumdar, ex-officio Secretary (Finance), Government of West Bengal, assisted the Committee by clarifying the financial aspects of the Durgapur Project, as viewed by the West Bengal Government at the several meetings of the Committee. The Committee also derived considerable assistance from Dr. A. Lahiri, Director, Fuel Research Institute, who was invited to the Second, Third, Fourth, Fifth and Sixth Meetings. The Committee record their grateful appreciation of the help rendered by these two gentlemen and by the Secretary, Shri K. Vyasulu.

9. It came to the Committee as a surprise that towards the end of March, 1955 the Planning Commission accepted the request of the Central Water & Power Commission for the withdrawal of Shri C. S. N. Raju from the membership of the Committee. In the circumstance, the interim report as well as the final report have not been signed by Shri Raju.

SECTION II

ASSESSMENT OF DEMAND FOR COKE

10. The first term of reference to the Committee is to make an assessment of the demand for coke as at present and over the next Five Year Plan period. With a view to obtaining a fair estimate, the Committee addressed a questionnaire to (i) individual consumers in the industrial sector, (ii) to associations of consumer industries, and (iii) to major consumers in the public sector, *viz.*, Railways and Ordnance Factories. The estimated demands of the industrial units and the companies, who replied to the questionnaire, are summarised in Appendix 'B'.

11. The replies from the Hard Coke and By-products Producers Association, the Indian Foundry Association and the Fuel Research Institute, which conducted a statistical survey into the demand for hard coke, will be found in Appendix 'C'. The survey of demand for by-product hard coke made by the Government of West Bengal, which is to be found on pages 21 and 22 of the publication "Durgapur Project—Its Role in the Economic Life of West Bengal" is also reproduced in Appendix 'C'. This survey estimated the requirements of by-product coke by 1960 at 815,800 tons.

12. The Hard Coke & By-products Producers Association observed that an accurate assessment of present demand was complicated by several artificial factors, the chief of which are as follows:—

(i) Some classes of internal consumers who would prefer to take by-product coke are compelled by the Coal Commissioner to accept the inferior commodity manufactured in bee-hive and 'country-type' ovens.

(ii) The export of hard coke is also subject to control and restrictions imposed from time to time on the export of Indian coke, which have made it difficult to assess the scope of a market which is in any case spasmodic in character;

(iii) There are many small consumers, such as foundries, which do not have a regular demand, but which apply for coke procurement permits when their order books for finished articles justify the procurement of raw materials. Within the somewhat cumbrous frame-work of control and inadequate transport facilities, it is not always possible for them to obtain the tonnage they want *when* they want.

(iv) As a result of the restrictive factors mentioned above and also of the recent shortage of coke, consumers are understandably liable to exaggerate their requirements when answering official questionnaire issued in an endeavour to estimate demand. If a consumer has been used to having his requirements cut by (say) 50 per

> cent. or to 50 per cent. of his needs being diverted to bee-hive coke, then he will naturally inflate his demand when answering any official enquiry in the hope of securing his actual requirements, even if the figure he gives is halved by the controlling authority. This is a very real factor and should not lightly be ignored."

13. In the opinion of the Association, the production and the demand in 1953 were roughly equal. With a production of 250,000 tons of by-product coke by **the four merchant coke plants and** supple ed by the output of the Giridih plant, the demands for by-product coke in the year were fully met. In other words, the demand for by-product coke in the year were fully met. In other words, the demand for by-product coke in the country in 1953 was about 285,000 tons. In their view, the demand for coke was of the same order as despatches made and had there not been an unfortunate breakdown of the Lodna plant early in 1954, leading to a fall in the output of the by-product coke by 4,000 tons a month, there would not have been a shortage even after 1953. The output of by-product coke in 1954 was lower than that of 1953 by about 57,000 tons. Though this fall was offset by an increase of 36,000 tons in the output of bee-hive coke, the consumers particularly the foundries complained of shortage, since they had to use bee-hive coke, partly at least. The necessity to use bee-hive coke is said to have increased their coke consumption apart from creating operational difficulties. As regards future demands, the Association stated that they were unable to make a forecast as they were not aware of the developments envisaged.

MEMORANDUM OF THE INDIAN FOUNDRY ASSOCIATION

14. The Indian Foundry Association estimated the requirements of coke for foundries, on the basis of the allocation of pig iron to the foundries. They estimated pig iron allocation at 376,000 tons during 1954. They assumed (a) that actual receipts of pig iron were 10 per cent. short of allocations, (b) that scrap equivalent to pig iron quantity was utilised by foundries, (c) that 70 per cent. was the yield of good castings in the foundries and (d) that coke consumption was about 30 per cent. of finished castings. On these assumptions the requirements of coke for foundries in 1954 were assessed at 1,42,800 tons. The Association have further stated that the requirements of foundries by 1955-56 might go upto 180,000 tons, and the total estimated demand for coke in the country would be 567,000 tons. They have further added that on an indirect basis, the requirements of coke during the Second Plan period would be about 700,000 tons.

15. As regards the expansion schemes of foundries, the Association have pointed out that the smaller foundries consuming coke upto 200 tons per annum did not have any expansion programme worth mentioning, and that foundries with an annual consumption of between 200 to 500 tons envisaged an increase in hard coke consumption by about 10 to 15 per cent. on account of the expected fuller utilisation of their existing capacity. It was only the bigger foundries with an annual consumption of 1,000 tons and above, who had some real expansion plans.

16. Regarding the supplies of coke, the Association holds that there is a shortage and that bee-hive coke is unsuitable for casting purposes. Reference has also been made by them to high prices for coke and to the pilferage of coke in transit.

SURVEY OF HARD COKE REQUIREMENTS IN INDIA BY THE FUEL RESEARCH INSTITUTE

17. Copies of the Survey Report were made available to the Committee by the Director, Fuel Research Institute. The Hard Coke and By-products Producers Association forwarded to the Committee their criticisms on some of the conclusions reached in this Report. The major conclusions reached in this Survey Report are:

(a) There is at present a shortage of 40 to 45 per cent. of coke equivalent to 20,000 tons of sized coke per month;

(b) Only 51 per cent. of the consumers are satisfied with the quality of coke supplied to them;

(c) The present monthly requirements of 44,000 tons, as estimated by the Chief Mining Engineer, Railway Board, consist of 7480 tons at below 2", 13,200 tons as between 2" and 4" and 23,320 tons as above 4";

(d) By the application of the statistical method, the total requirements of sized by-product hard coke by 1960, are estimated to be approximately 59,000 tons per month and a production capacity of 78,000 tons per month would have to be brought into existence for meeting this demand;

(e) According to the alternative method of assessment of requirements based on targets of capacity in different industries expected to be implemented and the anticipated availability of 1.2 million tons of feed metal for foundries, the requirements of hard coke are estimated at 68,000 tons per month;

(f) The authorities concerned with industrial activities in the country should make an attempt to eliminate wasteful bee-hive production altogether and replace it by modern methods of coal distillation;

(g) The production of sized coke above 2" does not amount to more than 75 per cent. of total production.

18. As the estimates of these important bodies and their basis for working the future requirements were not fully acceptable to the Committee, the Committee made their own assessment of the current and future demand for coke on the basis of the material received in reply to the questionnaire and the data furnished by the Secretary to the Committee in respect of future programmes in the public and

private sectors and the schemes approved for implementation by the Central Government. The Committee are not in a position to forecast with any degree of precision the materialisation of the development projects, particularly in the private sector.

19. The data relating to demand, production and despatches of coke since 1951, pertaining to the four merchant plants, the Giridih Coke Oven Plant and the bee-hive ovens are given below:

		Production		Despatches	
	Demand	By-product	Bee-hive	By-product	Bee-hive
1951	582,415	280,734	106,625	279,916	102,581
1952	621,008	276,711	111,396	268,160	120,806
1953	483,876	275,102	128,510	280,021	128,070
1954	484,921	218,644	157,008	226,949	166,359

N.B.—Demand from Sindri has been excluded since it was being met almost exclusively from IISCO's hard coke production.

20. Though the demands in 1951 and 1952 showed wide variations, which it would be difficult to support on the basis of any wide variations in requirements, they have been nearly the same in 1953 and 1954. We have been advised by the Coal Commissioner that the accepted demands of his Organisation in 1953 might be taken as a reasonably accurate indication of current requirements and that the Committee could make the figure of 483,876 tons as the basis for their calculation of demand by 1960. A reveiw of the quotas allocatd for various consumers was carried out in 1952 by Coal Commissioner's Organisation and the figure of demand in 1953 amounts virtually to a fresh assessment after scrutiny.

21. The foundries are one of the important consumers of hard coke at the present time in the country and their demands in 1953 and 1954 were estimated at about 150,000 tons per annum. The actual demand for foundry castings is much higher than this figure since the indents made by the cotton textiles, jute textiles cement and a part of the demand of the sugar industry (6,000 tons out of the total consumption of 23,000 tons) are for the production of castings required for maintenance and replacement purposes.

The demands of large-scale engineering industries are mostly for the requirements of foundries, attached to their works and the Railway Board have stated that 95 per cent. of the demand for hard coke in their workshops represented foundry requirements. Apart from this requirement, the second major demand is the one placed by the different States under 'Z class demand' in the classification of the Coal Commissioner's Organisation representing the requirements of large number of small-scale industries and smithies. This requirement was placed at 120,000 tons of coke above 1" size in 1954.

The demands of other industries are relatively less important as the following statistics show:

Monthly industry-wise demand for coke in January, 1955 *excluding exports*

Railways	4,180	tons	Paper Mills	54	tons
Municipalities & Water Works	36	,,	Enamel Works	90	,,
Electric Supply Co.	160	,,	Food Products	290	,,
Primary Producers of Steel	3,400	,,	Leather Works	36	,,
Cement Factories	400	,,	Glass Factories	360	,,
Copper Corporation	18	,,	Vanaspati Products	450	,,
Ordnance factories	725	,,	Chemical Works	1,063	,,
Potteries	1,212	,,	Distillaries	18	,,
Refractories	100	,,	Sugar Mills	3,360	,,
Woollen Mills	40	,,	Re-rolling Mills	256	,,
Cotton Mills	800	,,	Miscellaneous	1,743	,,
Silk Filatures	72	,,	Educational Institutions	36	,,
Jute Mills	450	,,			
'Z' Class States	9,944	,,	Total	41,735	,,
Engineering and Foundries	12,872	,,			

22. Since accurate data regarding consumption by different industries were not available, the Committee assessed the present demand within the country under two broad heads namely, consumption by foundries and consumption in other industries.

	Tons
(*i*) Demands for hard coke accepted by the Coal Commissioner's Organisation in 1953	483,876
(*ii*) Less Exports	21,398
(*iii*) Demands within the country (*i*)—(*ii*)	462,478
(*iv*) Estimated consumption by foundries	96,050
(*v*) Demands of other consumers (*iii*)—(*iv*)	366,428

The estimated consumption by foundries (iv) above was worked with reference to the despatches of pig iron and assuming, as has been done by the Foundry Panel of the Engineering Capacity Survey Committee in its Report, that the feed metal for foundries consisted of 50:50 of pig iron and scrap. The requirements of coke for producing a ton of the molten metal for castings was assumed at 0.25 tons as an average as against actual consumption which is stated to have varied between 0.16 tons and 0.30 tons depending on the size of the foundry and the efficiency of operation. The estimated consumption of coke during 1952, 1953 and 1954 is given at item (4) of the table below showing allocations of pig iron, actual despatches etc.

(In ,000 tons)

	1952	1953	1954
1. Allocation of pig iron	272	313	276
2. Actual despatches	202·6	192·1	197·2
3. Charge of pig iron plus scrap into cupolas	405·2	384·2	394·4
4. Requirements of coke for (3) (0·25 tons of coke per ton of molten metal)	101·3	96·0	98·6

FUTURE DEMAND FOR HARD COKE

23. The Committee obtained data on the future requirements of hard coke from major consumers in the public sector, *viz.*, Railways and Ordnance Factories. The consumption by the former is expected to increase from 45,043 tons in 1955 to 49,555 tons by 1960. They have also stated that 95 per cent. of their hard coke demand is for foundry purposes. Ordnance factories expect to consume 9,000 tons in 1955 and gradually increase it to 14,000 tons between 1956 and 1958 and finally to 16,000 tons by 1960.

Foundries Demand:

24. The requirements of coke by foundries would depend upon the demand and availability of pig iron by 1960. It is understood from the Iron & Steel Controller that the requirements of pig iron (inclusive of the consumption by the steel works in their own foundries and the spun pipe plant of IISCO estimated at 280,000 tons) would rise to about 700,000 tons by 1960. Out of the above, 420,000 tons of pig iron would be the demand for foundries. According to current practice, this would be supplemented by an equal tonnage of scrap in the feed metal on which the demand for coke is to be assessed. The total quantity of pig iron and scrap to be used in foundries would then be 840,000 tons including the consumption expected in Railways. At 0·25 tons per ton of feed metal, 210,000 tons of hard sized coke would be required by the foundries alone.

25. On the other hand, if the pace of industrial development gathers greater momentum than envisaged by the Iron & Steel Controller and the entire quantity of pig iron expected to be available as marketable surplus from the existing steel plants by 1960 could be consumed by industries, along with an equal quantity of scrap, the demand for coke by 1960 would be as under:

Pig iron expected to be available in 1960	513,00 tons*
Total tonnage of pig iron and scrap utilised	1,016,000 "
Demand for foundry coke	254,000 „

* This does not include possible supplies of pig iron from new steel plants.

26. In the matter of proportion of pig iron and scrap used in foundries as feed metal, there is wide variation. Normally with proper raw materials foundry practice does not warrant the adoption of 50:50 ratio; but to be on the liberal side, the Committee have adopted this ratio in their calculation of coke demand.

27. A rate of 0·25 tons of coke per ton of molten metal has been adopted in the calculations of the Committee. The Development Wing to the Ministry of Commerce & Industry have advised that in the best foundries of the country, the consumption has been as low as 0·16 tons as against 0·3 to 0·35 tons in the small inefficient foundries with poor equipment and techniques and raw materials. With efforts directed towards improving foundry practices in the small-scale sector and by providing more by-product coke, the rate of consumption of coke could be brought down to an average of 0·2 tons per ton of feed metal. However, these developments would

naturally take sometime to be effective in all foundries. Therefore, the rate of 0·25 tons of coke per ton of feed metal has been adopted by the Committee in their calculations.

28. The Foundry Association have pressed strongly that their full requirements should be met in the form of by-product coke and at several foundries visited by the Secretary during the last two months, this fact was impressed upon him by the technicians in charge.

Coke for Steel Castings Industry.

29. The demand for steel castings has been assessed by the Foundry Panel of the Engineering Capacity Survey Committee. According to this report, which takes into account the steel castings requirements of different consumers, the demand for steel castings is placed at 20,050 tons in 1960 as against 16,575 tons in 1953-54. The corresponding coke requirements have been assessed at 6,000 tons and 4,900 tons respectively representing an increase of 1,100 tons over 1953-54.

Malleable Castings

30. The present annual capacity of the six foundries at present dealing in this type of production is about 3,500 tons. The production at present, however, is of the order of 1,600 tons per annum. The annual demand is about 15,000/17,000 tons of castings. The new foundry of the Tata Locomotive and Engineering Company is expected to be equipped for producing malleable iron castings also, but it would employ electric smelting process. Assuming a production of 15,000 tons of malleable castings by 1960, the demands for hard coke would be about 6,000 tons per annum. The additional requirements of coke in respect of steel and malleable iron castings have been estimated at 9,000 tons by 1960.

Iron & Steel.

31. The additional demand under this head is envisaged mainly from the Mysore Iron & Steel Works. The demands placed in 1954 by this factory were for about 40,000 tons and are expected to rise to 60,000 tons by 1960.

Ferro-manganese & Ferro-alloys

32. It is understood that Government have sanctioned the installation of a capacity for 1,058,000 tons of ferro-manganese per annum, excluding the Kalinga Ferro-Alloys Ltd., referred to separately below. Details relating to the six approved schemes involved are as under:

Name of the Firm	Location	Annual capacity (tons)
1. Jeypore Mining Syndicate Ltd.	Rayagada (Orissa)	10,000/12,000
2. Mysore Iron & Steel Works	Bhadravathi	1,800
3. M/s. Electro Metallurgical Works Ltd.	Bombay	12,000
4. Indian Ferro Alloys Ltd.	Bihar	20,000
5. Kambata Industries	Madhya Pradesh	30,000
6. Tata Iron & Steel	Joda (Orissa)	30,000
	TOTAL	105,800

Assuming that all the schemes would purchase coke from the market, the total demand for coke for this industry would come to be about 75,000 tons per year at the rate of 0·75 tons per ton of ferro-alloy.

33. The Tata Iron & Steel Company have, however, stated that they have not yet decided whether they would themselves produce the coke for their proposed ferro-manganese plant or they would purchase it from outside sources.

34. A scheme for the establishment of a low shaft blast furance in Orissa by the Kaling Ferro Alloys Ltd., for the production of pig iron and/or ferro alloys including ferro-manganese and ferro-chrome has been licensed by Government recently. This requires about 20,000/30,000 tons of coke per annum according to the sponsors of the scheme. This has been listed separately since it envisages manufacture of pig iron and ferro-alloys and could not, therefore, be appropriately classified exclusively under "Iron & Steel" or under "Ferro-manganese"

Aluminium, Lead, Antimony & Copper

35. From the communications received from the two existing aluminium producers, their demand is expected to diminish by about 2,000 tons from 1957 onwards. It is expected to be about 1,600 tons in 1960. An increase in consumption by about 4,000 tons over 1953 is visualised by the Metal Corporation of India. The net increase in demand in this sector would thus be about 2,400 tons by 1960.

Calcium Carbide

36. The plant belonging to M/s Birla Jute Manufacturing Company, which went into regular production of this material in early 1955, is estimated to require 5,400 tons of coke per annum. The Committee have been advised by the Chief Industrial Adviser to the Ministry of Commerce & Industry that the requirements of coke for the carbide industry may be placed at 15,000 tons by 1960, and this would be of special quality.

Chemical Industry

37. Soda ash and chemical lime are the two important products in the manufacture of which coke is consumed in the chemical industry. Lime is required in carbide manufacture and in several organic chemical industries as a weak alkali. The coke requirements for producing chemical grade lime are envisaged at 10,000 tons by 1960. As regards soda ash, the Central Government have sanctioned three new schemes, one in Saurashtra (66,000 tons per annum), one in Tuticorin (66,000 tons per annum) and one in Dehri-on-Sone (40,000 tons per annum). The last project is based on the modified soda ash process, producing soda ash and ammonium chloride simultaneously. As against a combined total consumption of 94,000 tons of coke by 1960 by all the plants, existing and projected, the scheme of Rohtas Industries is expected to require 47,600 tons per annum after 1959. This total demand for coke includes certain provision for coke for producing lime needed for causticisation of a part of soda ash to produce caustic soda. It is reported

that the sponsors of the Dehri-on-Sone soda ash project are reconsidering to locate their plant at Durgapur, in which case they would purchase coke-oven gas from the coke-oven plant and would not require coke for ammonia synthesis.

Fertilizer Industry

38. The Ministry of Production have constituted the Fertilizer Production Committee recently, to advise the Government on plants, processes etc., for stepping up the nitrogenous fertilizer capacity in the country by 1·7 lakh tons of fixed nitrogen in terms of different fertilizers. Our Colleague, Dr. Nagarajarao, who is a member of the Fertilizer Production Committee, has informed us that in the context of data so far available to that Committee, it is not likely that a plant based on coke as raw material would be recommended. In view of this, no additional provision has been made for this industry.

Sugar Industry

39. According to the Indian Sugar Mills Association's reply to the Committee, the requirements of coke by this industry including the foundries attached thereto are of the order of 35,000 tons per annum by 1960 as against about 23,000 tons at the present time.

Vanaspati Industry

40. The present annual demand of about 5,400 tons per annum for production of hydrogen by the steam-iron process is expected to continue during the period of the Second Five-Year Plan. According to the Hindustan Vanaspati Manufacturing Company, their requirements are estimated at 4,200 tons against a consumption of 2,882 tons in 1954.

Refractories Potteries, Glass & Enamel Works and Food Products

41. The demands in these lines are almost entirely for coke-breeze above ½″ and the quantity required in 1953 has been estimated at about 25,000 tons to 30,000 tons, inclusive of that of a subsidiary of IISCO itself. This can also be substituted by town gas depending on price. No increase is, however, envisaged in the coming five year period under this head.

Unforeseen Demands

42. These include demands for exports under bi-lateral trade agreements or from the development of projects like cement-sulphur project, which is reported to be under consideration of the Bikaner Gypsums Ltd. A provision of 50,000 tons by 1960 is considered adequate for these unforeseen demands.

43. The total requirements of hard coke by 1960 as detailed above are summarised in the following table:

Demands accepted in 1953 by Coal Commissioner's Organisation	483,876	tons.
Less exports	*21,398*	,,
Demand within the country	462,478	,,
Less estimated consumption by foundries	*96,050*	,,
Demands of other consumers in 1953	366,428	,,
Consumption in 1960 by foundries	2 10,000	,,

Consumption in :		
(*a*) Ferro-manganese industry	75,000	tons
(*b*) Low shaft blast furnace of Kalinga Ferro Alloys	20,000—30,000	,,
(*c*) Calcium Carbide	15,000	,,
(*d*) Lime Kilns	10,000	,,
Additional demands for :		
(*a*) Soda ash industry	80,000	,,
(*b*) Sugar industry	12,000	,,
(*c*) Mysore Iron & Steel Works	20,000	,,
(*d*) Malleable castings and steel castings	9,000	,,
(*e*) Non-ferrous metals	2,400	,,
Unforeseen demands including consumption by other industries	50,000	,,
	869,828—879,828	tons.

We have noted Shri Ramadhyani's view that export of coke or coking coal, except to a nominal extent, is unlikely to be permitted in view of the requirements of the steel plants and the policy of conservation of coking coal. The Committee referred the matter to Government, but no reply has so far been received.

44. The Committee, therefore, envisage on the basis of the above analysis that the total requirements of hard coke by 1960, exclusive of the consumption of steel works and their subsidiaries and the Sindri Fertilizer Factory, would amount to 875,000 tons. If TISCO do not finally obtain their requirements of coke for their ferro-manganese project from the merchant plants and the Rohtas Industries shift their primary raw material from coke to coke-oven gas obtained from a coke-oven plant, the requirements might go down by about 70,000 tons.

45. It is estimated that 95 per cent. of the total demand (*i.e.,* 831,000 tons) would be for sized coke mainly over 2″ but including a small fraction between 1″ and 2″ as well; the balance is expected to be required in the form of sized coke breeze mostly in engineering industries, refractories, etc., as a raw material for the generation of gaseous fuel, producer gas.

46. Of the total demand about 100,000 to 110,000 tons of coke would have to be of a grade raquired in ferro-manganese and similar ferro-alloys production. Another 15,000 tons of coke conforming to more stringent specifications would be required for calcium carbide manufacture. The requirements of special grade coke for malleable iron castings and special steel castings have also to be produced in the country by 1960.

47. The demand for foundry coke has been estimated at 210,000 tons by 1960 on the basis of the demand for pig iron visualised at 420,000 tons by 1960 and assuming that feed metal to the foundries would consist of 50:50 of pig iron and cast iron scrap. On the basis of data furnished in respect of expected availability of iron between 1955 and 1960, it seems that the requirements as estimated above may not materialise till the end of 1958. This situation may not arise if by some arrangement the required pig iron supplies could be ensured to the industries.

48. Expected availability of pig iron as ascertained from the replies to the Questionnaire and corresponding requirements of foundry coke are indicated below:—

(In '000 tons)

Year	Supplies of pig iron	Total volume of feed metal	Requirements of coke
1955	196·7	393·5	98·4
1956	202·2	404·4	101·1
1957	177·2	354·4	88·6
1958	243	486·0	121·5
1959	573	1146·0	286·5
1960	513	1026·0	254·0

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SECTION III

REPLACEMENT AND EXPANSION PROGRAMMES OF EXISTING PRODUCERS AND ADDITIONAL PRODUCTION FROM THESE AND ANY OTHER PROJECTED COKERIES

49. The Committee issued a questionnaire for obtaining data on past and future production from the four merchant cokeries (Bararee, Barrakur, Bhowra and Lodna plants), the Giridih Coke Oven Plant, the two main producers of steel in the private sector and also the Hindustan Steel Ltd. It also ascertained from the Sindri Fertilizers and Chemicals whether any surplus coke was likely to be available from their coke oven plant. The salient points from the replies of producers are summarised below:—

(a) No surplus coke could be expected for the market from the Sindri Fertilizer Factory, Tata Iron & Steel Co., and Hindustan Steel Limited. The Indian Iron & Steel Company have indicated a supply of sized coke during the Second Five Year Plan period varying between 66,000 tons in 1955 and 44,000 tons in 1960, the supply in 1959 being nil.

(b) The following programmes of renovation are stated to be either under implementation or envisaged by the merchant cokeries.

Lodna Colliery Co.

50. One of the batteries was dismantled in October, 1954 and is in the process of being rebuilt entirely. It is due to be back in production by the end of 1955 and its expected normal production will be 50,000 tons per annum.

Barrakur Coal Co.

51. A programme of repairing the whole battery of 40 Koppers Regenerative Ovens including the ovenchamber and brickwork below and above, which is in progress, is expected to be completed by the latter half of 1956. A higher efficiency than that for which the plant was originally designed is expected as semi-silica bricks are being replaced by silica bricks for oven chambers. This measure will enable carbonisation at a higher temperature and increase the output.

Bhowra Coke Co.

52. The Bhowra Coke Plant consists of two batteries—one consisting of 25 semi-solvay type ovens with a monthly average output of 4,000 tons of coke and a small unit replica of the first, capable of producing 1,400 tons of coke per month. It is stated that the rebuilding of the bigger unit started in 1951. The rebuilding of brickwork from soleflue level upto the crown has been taken up and completed by 1955. Renovation of second battery is expected to be taken up during 1955-60.

53. The Committee have been recently informed of the proposal of Bhowra Kankanee Collieries Ltd., the present owners of the Eastern Coal Company, to take over the Bhowra Coke Plant and expand it substantially. The present owner has, it is stated, declined to sell the coke plant to the Bhowra kankanee Collieries Ltd. As the Production Ministry withdrew the scheme from the purview of the Committee, we have not taken this proposal into consideration.

Giridih Coke Oven Plant

54. The Manager of the Giridih Coke Ovens, in his reply dated 18th December, 1954 to the Committee's Questionnaire, communicated that there was no programme of plant renovation and expansion envisaged to be taken up during 1955-60. On the other hand, our colleague, Shri Ramadhyani, in his capacity as Coal Commissioner, informed the Committee at its second meeting on the 10th February, 1955 that a scheme was under consideration for rebuilding the Giridih Coke Plant to its original capacity of 145,000 tons per annum. The full details of the scheme, including capital investment, pattern of recovery and utilisation of gas and other by-products, which have a vital bearing on the economics of an independent coke oven plant, have not been available for scrutiny by the Committee. Further, the Ministry of Production have suggested that the Committee need not discuss the Giridih Renovation proposal. Accordingly, the Committee have not discussed the proposal and assumed that only 27,600 tons of sized coke would be available from the Giridih plant in 1960 as intimated by the Manager of the Giridih Coke-ovens.

55. On the assumption that the renovation programmes furnished by the private merchant cokeries would be completed, their capacity is estimated at 307,000 tons by 1960 as shown below:

('000 tons)

	1955	1956	1957	1958	1959	1960
Barrakur	87·0	87·0	87·0	87·0	87·0	87·0
Bararee	60·0	60·0	60·0	60·0	60·0	60·0
Bhowra	42·0	45·0	60·0	60·0	60·0	60·0
Lodna	50·0	100·0	100·0	100·0	100·0	100·0
Total	239·0	292·0	307·0	307·0	307·0	307·0

Availability of sized coke from by-product coke ovens

56. The Hard Coke and By-products Producers Association have stated that the production of undersized coke and sponge coke would be 10 per cent. of the total output. We have, however, assumed these to correspond to 12½ per cent. of the total coke production which has been taken also as the capacity. On this basis, the production of sized coke from the private merchant plants is estimated at 269,500 tons by 1960. The total availability of by-product sized coke from existing sources indicated above (*i.e.*, inclusive of supplies from Giridih and IISCO) would come to 341,100 tons in 1960.

Availability of Bee-hive Coke

57. The production and despatches of bee-hive coke expanded considerably since 1952, particularly in 1954, when the output amounted to 168,000 tons as against 102,581 tons in 1951. The abnormal increase in 1954 was primarily due to the breakdown of

one of the batteries of Lodna Colliery Co. The bee-hive coke ovens act as a cushion in time of scarcity of by-product coke. The use of bee-hive coke is not viewed with favour by the foundries owing to its poor quality in comparison with by-product coke. The importance of the requirements of foundries being met fully in terms of by-product coke was stressed before the Committee by the Indian Foundry Association. Nevertheless, there are certain consumers to whom this grade of coke may be acceptable and on the basis of such demands, the production of bee-hive coke may continue in future also. An output of 120,00 tons of coke per annum is envisaged from this sector. On this basis, the availability of sized bee-hive coke in 1960 would be 105,000 tons.

Gap between Demand and Availability by 1960

58. On the basis of the requirements and availability of sized coke from the different existing sources indicated above, there would be a gap of 384,900 tons assuming that Giridih plant is not renovated and only the old plant is operated and that the intimated supply of 44,000 tons of coke will materialise from the Indian Iron & Steel Company. The position in this respect is summarised as under:

		Tons
(*a*) Total requirements of sized coke . .		831,000
(*b*) Availability of sized coke :		
(*i*) 4 merchant plants	269,500	
(*ii*) Giridih plant (without renovation) . .	27,600	
(*iii*) Surplus from Indian Iron & Steel Co. .	44,000	
(*iv*) Bee-hive coke	105,000	446,100
(*c*) Gap in availability (Sized coke) . .		384,900

59. Out of the gap of 384,900 tons of sized coke, about 15,000 to 20,000 tons is expected to be of a very special grade, with ash below 12 per cent. and phosphorus below 0.03 per cent. for meeting the demands of calcium carbide industry, sodium sulphide manufacture and special castings production, and requiring washing of even Giridih Coal by froth flotation technique. About 100,000 tons to 110,000 tons of the balance would have to correspond to the quality requirements of electro-thermal ferromanganese and other ferro alloys industries in which the limits for phosphorus and ash are stated to be 0.05 per cent. and 20 per cent. respectively. The electro-thermal ferro-manganese grade of coke could be produced according to Dr. Lahiri, Director, Fuel Research Institute, from the Laikdih and Disergarh coals or their blends with Giridih coal. Its production is also envisaged under the Durgapur Scheme. The additional tonnage of the normal grade of sized coke that has to be produced by 1960 would vary between 250,000 to 270,000 tons.

SECTION IV

APPRAISEMENT OF DIFFERENT LOCATIONS FOR GREATING ADDITIONAL CAPACITY FOR COKE

60. In the third item of reference to the Committee, they have been asked to advise on the exact quantum of development and the size of the plant or plants that will have to be established and on their appropriate locations, and in this connection to make an appraisal of the economics of the West Bengal Scheme referred to in the Government directive. Having assessed the size of the deficit in 1960, which determines the quantum of further development required, it is necessary to give consideration to the problem of appropriate locations for new plants.

61. The problem of industrial location is vast. For coming to reasoned conclusions on this issue, the Committee would need to study several aspects of the different coal fields and the coal in this country; several possible areas would have to be selected and the merits or demerits of each for the purpose analysed and a comparative study made, before suitable locations could be indicated. The volume of work and the investigation that would be involved would take considerably longer period for the Committee to complete such a study, if required. As the Committee had no time to make any such study so far, and the time limit for the submission of the report has been reached, they have not attempted to study the different appropriate locations for the coke plant or plants to be established other than Durgapur. If the Planning Commission consider that such an investigation is required and it would be advantageous to them to have ready data on the subject for their future guidance, the Committee would like to suggest that separate arrangements should be made for undertaking such an exhaustive study.

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62. The Committee would only like to state here, in broad terms, the general principles which should govern the location of a modern coke plant. These are:

(a) As the raw material required is coal of suitable quality, an independent coke oven plant, as distinguished from an integrated plant required in the Steel Industry, may with advantage be located in or near coal fields, other things being equal such as supply of water, condition of the coal strata below the ground, etc. The location in or near coal fields would reduce transport cost on coal substantially. Unless other disadvantages exist, it may be advisable to establish such coke ovens in close proximity to coalfields, so that the coal required could be directly delivered from the pit mouth either through tram lines or by overhead ropeways, etc., without involving further loading, handling, transport by rail, unloading, rehandling, etc.

(b) The other usual facilities for the location of industries such as the availability of cheap supply of water, power, labour, transport etc., should be ensured. They should be already available or conveniently developed in or around the coal fields.

(c) Easy disposal of surplus coke oven gas for industrial or domestic uses is an important factor to be considered in connection with location of new modern coke oven plants, whose capital cost is ever so much more than that of existing cokeries built 30 years ago, as without proper and economic disposal of gas, the profitable working of a modern coke oven plant may not be practicable. This can be achieved only if the plant is established in a centre where uses for the gas can be ensured. In the conditions now existing in our country, this can be done only if coke oven plants are located near industrial areas or big cities where gas consumption can be ensured. The alternative would be to examine the economics of transmitting the gas to such centres from the site of the coke oven plant itself, if possible.

63. The Committee have been unable to consider the different appropriate locations for new coke plants, other than Durgapur proposed by the West Bengal Government. The Committee are, therefore, not in a position to compare the advantages of the Durgapur site with those of other sites. An examination of Durgapur from the various criteria of industrial location applicable to coke oven plants shows that it has facilities of quick transport towards Calcutta side from a four-track railway system soon to be electrified, cheaper railway freight for coke than from Jharia or Giridih or Bokaro, future availability of water transport through Durgapur canal towards Calcutta and places in between, cheap land, water supplies, trained labour and a developed colony, and is situated fairly close to coal and power and the markets of greater Calcutta. In the circumstance, the Committee are of the view that Durgapur is a suitable location for a plant of the capacity envisaged under the Durgapur Project, *i.e.,* 292,950 tons of plus 1″ sized coke per annum.

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SECTION V

DEMAND FOR PRIMARY OGANIC CHEMICALS AND OTHER BY-PRODUCTS, COAL-TAR DISTILLATION PRODUCTS: PRICE LEVELS FOR THESE PRODUCTS BY 1960

64. While Durgapur could be a favourable site for the coke-oven plant for securing additional production of coke, the economics of this project have to be appraised in the context of the different developments taking place in the country in the field of recovery of by-products of coke-oven plants and their further processing. The Defence Department is also considering the expansion of benzol capacity in their plants at TISCO and IISCO apart from the creation of similar facilities in conjunction with steel plants in the public sector. The crude benzol produced at all the locations is also proposed to be processed into benzene, toluene and other hydrocarbons. The expected availability of benzol, benzene and toluene by 1960 is given below:

	Expected availability 1960 (In '000 gallons)		
	Crude Benzol	Benzene	Toluene
Defence plants at TISCO & IISCO (*a*)	2,400	600	401·6
Bararee Coke Company (*a*)	120	36	9·0
Sindri Fertilizer Factory (*a*)	630	259	52·5
Hindustan Steel Ltd. (*b*)	4,260	2,040	468·0
Madhya Pradesh Steel plant (*c*)	3,600	1,800	390·0
	11,010	4,735	1,321·1

(a) Data supplied by producers.

(b) Hindustan Steel Ltd. have supplied data on the basis of installed capacity for coke of 540,000 tons for a 500,000 tons ingot steel plant. The quantities mentioned have been doubled as suggested by them since the proposed capacity of the plant has been raised to 1.0 million tons of ingot steel.

(c) The capacity for coke production is 900,000 tons per annum. The availability of benzol has been calculated assuming the yields of Hindustan Steel Ltd. For conversion into gallons, a ratio of 300 gallons per ton has been assumed.

As against the total availabilities mentioned above, the anticipated requirements of benzene by 1960, arising mainly from the demands of Ordnance Factories, production of D.D.T. and benzene hexachloride and of dye-stuff intermediates and synthetic drugs are expected to go upto about 2·0 to 2·5 million gallons. The private demand for toluene is small, the consumers being the paint and dye-stuff industries and pharmaceuticals. The total requirements of toluene by

1960 will be of the order of 1·5 to 2 million gallons per annum. Examining these demands from the regional angle, it is found that the new consuming industries are developing at locations which would be more economically catered by the rectification plant in Madhya Pradesh. On the basis of the present information, the consumption in West Bengal would come to about 130,000 gallons of benzene and 53,000 gallons of toluene. In the financial assessment of the Durgapur project, despite the above position we consider that credit could be taken for 500,000 gallons of benzene and corresponding quantities of toluene, xylene and solvent-naphtha in view of the potentialities for industrial development in the Bengal-Bihar area. The Committee feel that the balance of the benzol fraction from the coke oven plant would have to be marketed as motor fuel.

Coal tar distillation products.

65. As in the case of the processing of crude benzol, the new steel plants visualised in the public sector have provided for coal-tar distillation units. The Hindustan Steel Ltd., would produce 28,000 tons of coal-tar pitch and 1,000 tons of phenol on the basis of 1 million tons ingot capacity which has been accepted by Government. The tar distillation plant could be equipped to produce wash oil needed for the recovery of benzol. The Madhya Pradesh Steel Plant is proposed to be equipped to produce in the tar distillation plant compressed naphthalene, raw anthracene, pitch anthracene oil, absorption oil, phenol and prepared pitch. It is understood that there might be some modifications in respect of the size of operations of by-product recovery and tar distillation at these steel works. The requirements of road tar in the country at the present time are estimated at 150,000 tons including bitumen imported from abroad and used for the same purpose. The Burmah Shell Refinery, which has recently gone into production, is equipped to produce 150,000 tons of bitumen. A large part of the coal-tar pitch produced at the new steel works can be expected to be converted into road tar. In the circumstances, the coal-tar distillation products would have to be sold in a competitive market within the country as well as for exports. In view of this, the Committee consider that for computation purposes, it would be prudent to take credit for road tar at Rs. 200 per ton, for naphthalene at Rs. 1,000 per ton, for benzene and toluene at Rs. 1-12-0 per gallon and for motor benzol at Rs. 1-3-0 per gallon. As regards wash oil, a product of higher absorption capacity for arometic hydro-carbons than so far produced in the country is expected to be manufactured in the Durgapur Plant. The Committee have therefore assumed a price of Rs. 450 per ton of this product. The market for 1,900 tons of wash oil for which credit has been taken is based on the assumption that, owing to its superior quality, the wash oil from the Durgapur Plant has a chance of being preferred for the extraction of crude benzol by the new steel plant in the Bengal-Bihar area under consideration of the Central Government, the new coke ovens under the expansion scheme of TISCO and IISCO and the carbonisation plant under the Niveli Lignite Project.

66. As regards ammonium sulphate, both the new steel plants are being equipped for its recovery. Additional capacity for the production of ammonium sulphate is also being planned so that an

extra 1·7 lakh tons of fixed nitrogen in terms of different fertilizers would become available during the Second Plan period in the first stage. Additional production would subsequently be stepped up to 2·5 lakh tons of fixed nitrogen. With the increased application of manure, the agricultural production in the country is expected to be augmented and prices of food stuffs maintained at a reasonably low level. Having regard to all these considerations, the Committee consider that credit should be taken for ammonium sulphate at Rs. 220 per ton. They, however, recommend that the by-product plant should do away with the ammonium sulphate plant; and since the representatives of the West Bengal Government accepted this proposition, corresponding changes have been made in capital estimates and a price of 6 annas per lb. of ammonia and Rs. 180 per ton of sulphuric acid have been assumed for calculating the credits.

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SECTION VI

ESTABLISHMENT OF A THERMAL POWER PLANT AS AN ADJUNCT TO THE DURGAPUR COKE OVEN PLANT FOR IMPROVING ITS ECONOMICS OF OPERATION

67. The Committee have been asked to report on the scope for and economics of a thermal power plant as an adjunct to a coke oven plant if established at Durgapur taking into consideration the power generation programme of the Damodar Valley Corporation and the anticipated growth of load for electrical power in the Bengal-Bihar area. The economics of coke oven plant can be improved considerably if the industrial demand for gas could be developed simultaneously in the vicinity. The Durgapur coke oven plant would have a surplus of 8·18 million c.ft. of gas per day and there are at the present time no industries in existence in the vicinity of Durgapur to provide an outlet for the gas either as fuel or as industrial raw material. The scope for the utilisation of coke oven gas as a domestic fuel in the immediate vicinity is also non-existent, or, even if developed, cannot be expected immediately to account for a steady 24 hour consumption of any significant proportion of the total gas available from the plant. The Committee have been informed that there are proposals for the establishment of a soda ash-*cum*-ammonium chloride project based on supplies of coke oven gas from the Durgapur plant under consideration of a party to whom licence was given for the establishment of a plant at Dehri-on-Sone. The attention of the Planning Commission has, it is stated, been drawn to the possibility of a refractories plant also. The report of the Development Wing of the Ministry of Commerce and Industry on the scope for additional capacity and location of new units in Soda Ash Industry in India, expresses the view that Durgapur is a favourable location for the establishment of a soda ash plant based on the modified process. They have, however, observed that "doubts have been expressed about the use of sea salt in this process and consultations with experts will be necessary to find out whether the use of sea salt would be feasible so as to secure a further reduction in the price of soda ash". The success of the project would further depend upon the possibilities for the use of ammonium chloride as a fertilizer. Apart from the possibility of demand from soda ash plant and a refractory works, there are no other industries in prospect which can be expected to purchase coke oven gas from the Durgapur plant. The West Bengal Government have referred to a Fertilizer Factory at Durgapur. In addition to ammonium chloride referred to above, it is doubtful whether additional capacity for fertilizers could be envisaged for development at Durgapur during the Second Five-Year Plan. Even if an iron and steel plant comes to be located at Durgapur during the period of the Second Five-Year Plan, it would not provide an outlet for the gas from the Durgapur Coke ovens since the steel plant would be an integrated unit producing its own coke having coke oven and blast furnace

gases of its own to be utilised in the Works. In fact, steel plants usually have small quantity of surplus gases which they provide for other consumers.

68. The Committee therefore consider that in the first few years, gases from the Durgapur Coke Oven Plant (8·18 million c.ft. per day) have to be used mainly in conjunction with generation of power in a thermal power plant except to the extent that other outlets may be found in the vicinity. It is understood that an agreement has already been reached between the West Bengal Government and the DVC on the question of installation by the latter of a 30,000 kW thermal power station and that DVC would purchase power to the extent it is required from them by the Eastern Railway. This seems to establish the position firmly that on the basis of the preparations made and the anticipated expansion of power generation by them, the DVC would be in deficit in respect of the electrification demands of the Eastern Railway. In view of this, the Committee do not consider the need for a survey by them of the anticipated load growth in Bengal-Bihar area.

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SECTION VII

ECONOMICS OF THE DURGAPUR COKE-OVEN PROJECT

69. The detailed capital estimates, the financial computation and other particulars furnished by the West Bengal Government in early March, 1955 envisaged the following developments in the first phase of the Durgapur scheme:

(a) Coke-oven plant with throughput of 1,300 tons of coal per day;

(b) Auxiliary plants for the recovery of by-products from the coke-oven gas (ammonia, sulphuric acid, crude benzol and the rectified products, benzene, toluene, xylene);

(c) Coal tar distillation plant with a daily capacity for treating 100 tons of coal-tar per day with road tar, naphthalene, wash oil, hard pitch as the main products;

(d) Plant for the production of ammonium sulphate from ammonia and sulphuric acid mentioned in (b) above, or alternatively, plant for the production of 15 tons a day each of soda ash and ammonium chloride;

(e) A thermal power plant of 30,000 KW. to begin with to be duplicated later on, after consultation with the Damodar Valley Corporation;

(f) A gas grid, the first financial computation of which was given in the printed publication on the Durgapur Project furnished to the Committee in January, 1955.

70. The capital expenditure on the coke-oven plant and the by-product plants was estimated by them at Rs. 500 lakhs on the following basis:

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	(Rs. lakhs)
Staff quarters and office buildings	60
Factory buildings, railway yards, etc.	120
Plant and machinery	320

71. As regards gas grid, details of capital cost have been furnished in January 1955 as under:

	(Rs. lakhs)
(*a*) Cost of the grid including a pipe-line from Durgapur to Calcutta	200
(*b*) Cost of the grid from Durgapur to Chittaranjan . .	60
(*c*) Cost of the compressor station including/cost of metering all connections with the coke oven and with 100% stand-by	40
	300

72. The project report for the 60,000 kW thermal power station furnished to the Committee at its first meeting by the West Bengal Government, estimated the capital expenditure for it at Rs. 400 lakhs. The design of the station provided for coal feeding plant, ash handling system, boilers, turbines, alternators, transformers and switch-gears, station auxiliary, protection. The Committee understand that the capital estimates furnished by the West Bengal Government which formed the basis of calculations in this report are taken out from tenders which have already been obtained from a number of firms. They had however no opportunity to go through the tenders.

73. The Committee have only made a general examination of the capital costs of the coke oven plant and other projects covered under (a) to (d) above and worked out an estimate of the operating costs and the realisations from the different by-products on the basis of certain assumptions relating to demand and prices discussed in Section V. The capital cost of the coke oven plant requires the following revisions. The capital investment on coke oven and ancillary plants estimated by the West Bengal Government did not provide for customs duty on imported plant and machinery. It was further noted in the discussions on capital estimates that the tenderers provided for escalation to be mutually agreed upon and that the West Bengal Government have undertaken to furnish the following facilities and requirements at their cost:

(i) clearing the site,

(ii) providing accessible roads from the nearest highway and from the nearest railway siding in Durgapur,

(iii) provision for all roads with the necessary drainage alongside the roads on the worksite itself,

(iv) a railway siding,

(v) provision for water and power required for construction,

(vi) providing unfurnished accommodation to the staff for construction,

(vii) providing administrative buildings, laboratories, etc.,

(viii) provision for transporting and unloading at a distance of about 155 feet, all excavated soil, the responsibility of the contractors being only to load it in the transport vehicles supplied by the West Bengal Government; and

(ix) provision for river water to be delivered at the site.

74. Our colleague, Shri Aiyer, advised the Committee that the escalatory provision should be covered in the capital estimates and that this provision might be of the order of 12·5 per cent. of investment on plant and machinery. The consensus of opinion in the Committee on this question was that it was not necessary to provide for escalator contingencies as suggested by Shri Aiyer according to commercial practices. The effect of the two recommendations made by the Committee, *viz.*, that ammonia and sulphuric acid should be marketed separately instead of marketing them in the form of ammonium sulphate and that the size of the coal-tar distillation unit be reduced to a daily crude tar input of 50 tons instead of 100 tons as proposed by the West Bengal Government

(*Vide* para. 76 below) will be to reduce the capital investment by about Rs. 30 lakhs. The net reduction will, however, be about Rs. 25 lakhs after providing about Rs. 5 lakhs for ammonia cylinders in capital estimates. The position regarding fixed capital investment as revised is summaried below:

	(Rs. lakhs)
(*i*) Capital expenditure provided in the tenders . .	450·0
(*ii*) Customs duty at 5½% plus unforeseen expenditure .	40·0
(*iii*) Colony, roads, laboratory, etc.	60·0
(*iv*) Total fixed capital	550·0
Less saving in investment arising from the elimination of the ammonium sulphate plant and reduction of coal-tar distillation plant to a daily capacity of 50 tons tar input . .	30·0
Add for ammonia cylinders	5·0
The final fixed capital investment	525·0

The preliminary expenses such as expenditure incurred by the West Bengal Government for the project report and the interest charged for the period of construction (assuming that the project is financed through loan) will be written off from profits year by year according to commercial practice. The directive to the Committee is that they should make the assessment of the economics of the coke oven plants in the public sector as though they were commercial undertakings. These two items of preliminary expenses may amount to an extra Rs. 30 lakhs of the total fixed capital investment.

75. **Working Capital.**—The West Bengal Government have stated that they would finance the requirements of working capital from their revenue account. We consider that the working capital should be treated as a loan even if it be drawn from the revenue account. The requirements of working capital have been estimated at Rs. 35 lakhs.

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76. As regards the utilisation of ammonia obtained as a by-product from the coke oven gases, the West Bengal Government have pointed out that they had in mind the following two alternative patterns of utilisation (i) production of ammonium sulphate, (ii) production of soda ash and ammonium chloride by the modified process and direct sale of sulphuric acid. The Committee consider that the Durgapur Project should not visualise the latter alternative for the disposal of ammonia since a plant with a daily production of 15 tons of soda ash would not be an economic unit. The arguments against their soda ash plant would be stronger if the private party also developed this production at Durgapur. As regards the former pattern, the Committee have as already explained, suggested direct sale of ammonia and sulphuric acid and the economics have been worked on that assumption.

77. The Durgapur Coke-oven plant is envisaged, according to the data furnished by the West Bengal Government in their letter to Shri S. V. Aiyer, to turn out the following quantities of by-product per day:

About 930 tons of coke, 50 tons of crude tar, 3 tons of creosote oil, 9 tons of anthracene oil, 10 tons of naphthalene and naphthalene oil, 4·5 tons of ammonia, 10 tons of sulphuric acid, 16 tons of crude benzol and 3,300 m.c.ft. of surplus coke oven gas.

The Coal-Tar Distillation Plant would produce: 24 tons a day of road tar, 2 tons a day of naphthalene and 2,000 tons a year of wash oil.

Benzol Distillation Plant would produce 14 tons a day of motor benzol.

78. In the course of discussion on the economics of the project the West Bengal Government have finally furnished the following estimates of output and other details:

79. **Hard Coke.**—A blend of coals and coke breeze would be utilised for the production of coke in the ovens which have been specially designed for high yields of coke output. The daily charge of 1300 tons into the ovens would consist of 1235 tons of coal and 65 tons of coke breeze. The consumption of the charge for providing normal foundry coke and coke for ferro-manganese manufacture by the blast furnace method is stated to be as under:—

	Normal foundry coke	Coke for ferro-manganese manufacture.
Laikdih coal	60%	75%
Dishergarh coal	25%	..
Coke Breeze	5%	5%
Giridih coal	10%	20%

80. It has further been stated that the Giridih coal is not indispensable except for producing exceptionally low phosphorus coke. The manufacturing techniques and conditions would be based on the results of pilot plant experiments of various blends carried out on half-ton oven by the Fuel Research Institute who are also reported to be arranging for carrying out full-scale oven tests on final blends to be adopted after the completion of some more pilot plant trials in progress.

81. As regards yield of sized coke above 1″, which would fetch a price of Rs. 34-12-0 per ton, the latest figure communicated by the West Bengal Government corresponds to 91 per cent (837 tons) as against 86 per cent. intimated in January 1955. After recycling a part of the undersized product into the coke ovens, there would be another 28 tons below 1″ which could be sold at Rs. 12 per ton.

By-products of Coal Carbonisation

82. The yields have been worked out on the basis of a throughput of 1300 tons of coal per day. Since in practice, the coal carbonised would be only 1235 tons per day, the balance being coke breeze, the quantities of by-products recovered would be correspondingly lower. The West Bengal Government have envisaged the yield of crude benzol at 3·7 gallons per ton of coal carbonised as against 4 gallons suggested for the Interim Report and recovery of 90 per cent. therefrom as motor benzol. The combined yield of different

coal-tar distillation products is expected to correspond to 95 per cent. of coal-tar input. The yield of coke oven gas from a throughput of 1235 tons of coal is estimated at 14·8 million cubic feet at about 450-460 BTU per c.ft. After meeting the requirements for underfiring of coke ovens (43 per cent. of gas produced) and of the tar distillation plant (2·6 lakh c.ft. per day) a surplus of 8·18 million c.ft. is expected to be available daily for sale.

83. Having regard to the anticipated market for the rectification products of crude benzol from the Durgapur plant (500,000 gallons of benzene and corresponding quantities of toluene, xylene, solvent naphtha, etc.), it is expected that 1·6 million gallons of crude benzol would be distilled annually and that 460,000 gallons of crude benzol would be marketed in the form of motor benzol. The annual yields of different products on the basis of 350 working days and the selling prices assumed and the turnover of different products are indicated in the following table:

Product	Estimated annual output or surplus for sale	Estimated selling price in 1960 (Rs.)	Annual turnover (Rs. lakhs)
1. Coke :			
(*a*) Over 1″	292,950 tons	34 12 0 per ton	101·80
(*b*) below 1″	9,800 ,,	12 0 0 ,,	1·18
2. Motor Benzol	460,000 gls.	1 3 0 per galn	5·46
3. Benzene, Toluene, Solvent naphtha, Xylene	880,000 ,,	1 12 0 ,,	15·40
4. Still bottom oil	100,000 ,,	0 12 0 ,,	0·75
5. Road tar	9,286·25 tons	200 0 0 per ton	18·57
6. Naphthalene	682·5 ,,	1000 0 0 ,,	6·83
7. Wash oil	1,900 ,,	450 0 0 ,,	8·55
8. Other tar-distillation products	3,743·0 ,,	200 0 0 ,,	7·48
9. Ammonia (4·3 tons per day)	1,505·0 ,,	840 0 0 ,,	12·64
10. Sulphuric acid (9·5 tons per day)	8,326·0 ,,	180 0 0 ,,	5·99
11. Coke-oven gas (surplus for sale)	2,863·0 million c. ft.	5 annas per 1,000 c.ft.	8·95
		Total credits	193·61

EXPENDITURE ITEMS IN THE OPERATION OF THE PLANT

84. The break-up of the manufacturing costs and other items of debit has been estimated by the Committee as under:

	(Rs. lakhs)
(*i*) Cost of coal at 1,235 tons per day and Rs. 19 per ton f. o. r. Works	82·13
(*ii*) Processing costs of coke-oven plant, excluding the same from coal-tar distillation, benzene rectification and deducting the charges for ammonium sulphate section	32·00
(*iii*) Processing cost for coal-tar distillation	4·80
(*iv*) Processing cost for benzol rectification	3·20
(*v*) Cost of drums for packing road tar (at Rs. 60 per ton)	5·57
Total	127·70

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DEPRECIATION OF FIXED ASSETS AND LIABILITIES AND INTEREST ON WORKING CAPITAL

85. The depreciation has been calculated on the following basis·

Plant and machinery costing Rs. 325 lakhs (15 years life) .	21·7
Office and Residential buildings costing Rs. 60 lakhs (40 years life)	1·5
Factory buildings and connected civil structures costing Rs. 140 lakhs (25 years life)	5·6
Interest on working capital at 4% on Rs. 35 lakhs . .	1·4
Total . .	30·2

The manufacturing charges and provisions for depreciation and interest on working capital thus amount to 157·90 lakhs.

86. The Committee have estimated a certain level of prices for primary organic hydrocarbons (benzene, toluene, etc.) and coal-tar distillation products, which are no doubt lower than the current prices, but are consistent with the expected high levels of production. By and large, the working of the plants will, in the opinion of the Committee show a return of Rs. 35·26 lakhs representing a return of 6·8 per cent. on the investment of Rs. 525 lakhs before making due deduction for taxation of corporate profits as per the Indian Incometax Act, to which the profits would be subject if the project were treated as a commercial undertaking in the private sector. No provision has been made towards interest on all or a portion of the investment which might be secured in the form of loan, if any, as the Committee were not aware of the final capital structure proposed to be adopted for the implementation of the project.

87. The above assessment relates to the economics of the project covering items (a) to (d) of para. 69 (coke oven, coal-tar distillation and benzol distillation), plants, and is based on the assumption that the power plant of 30,000 kW agreed to between the Damodar Valley Corporation and the West Bengal Government would be a self-sufficient unit and would break even in its operations after (a) providing for all liabilities including those under the statutory provisions of the Indian Electricity Act, 1947 and under the taxation laws of the Central and State Governments and (b) crediting the coke oven plant for the gas supplied by it at the rate of five annas per 1000 c.ft. on coal equivalence basis. On such an assumption, the Coke Oven plant along with the allied schemes will yield a return of about 6·8 per cent. after providing for depreciation and interest on working capital. without providing 4 per cent. interest on Fixed Capital.

88. The Committee desire to point out that the economic assessment of the Durgapur Coke Oven Scheme as finally made out and presented in this report would require to be viewed against the following background and assumptions:

In the Durgapur scheme

(i) The coke oven and by-product plants are expected to be operated continuously at full rated capacities for 350 days/year instead of 300/330 days normally reckoned in the case of such industries in India so far.

(ii) A coke yield of 70 per cent. on coal and a sized coke yield (+1″) of over 90 per cent. of coke produced is expected to be achieved in the plant so that by feeding 1235 tons of virgin coal (suitable blends) with 65 tons of coke breeze re-used per day, 837 tons of coke saleable at Rs. 34-12-0 per ton would be obtained daily along with 28 tons of —1″ coke saleable at Rs. 12/- per ton.

(iii) The recoveries of coke oven and coal-tar products per day would be as follows:

(a) Crude benzol at 3·7 gallons/ton of coal charged and 90 of this would be recovered in the form of motor benzol, benzene, toluene, etc., to be sold at rates assumed in the report; in the case of benzene toluene etc., these would be in a pure form.

(b) Sulphur is recovered and converted into about 9·5 tons of sulphuric acid/day.

(c) 7·7 lbs. of ammonia per ton of coal in a marketable form as pure anhydrous ammonia will be recovered or 4·30 tons of ammonia/day.

(d) 0·04 tons of coal-tar per ton of coal (4 per cent.) will be recovered and on distillation, 95 per cent. of it will produce the quantities of different coal tar products reckoned in the calculation.

(e) 8:18 million cubic feet of surplus gas per day of 450/460 B.T.U./cubic foot will be available for disposal.

89. In this context, it has been explained to the Committee that, unlike the units operating in the country today, the Durgapur unit incorporates special techniques which would enable it to secure the higher outputs claimed by the State Government. Also their tenderers will have to agree to heavy penalties for nonfulfilment of the guarantees in regard to output and efficiency. It is also understood from Dr. Lahiri, Director, Fuel Research Institute, who has closely examined the details of the scheme and the techniques proposed to be adopted, that the investigations carried out by his institution and his study of the scheme justify the claim of the consultants to West Bengal Government, provided proper operational technique and various specifications suggested by him are observed. It is against this background that the Committee have worked out the economics of the Project as presented on pages 25-30 of this Report.

GAS GRID SCHEME

90. Regarding the gas grid envisaged by the West Bengal Government the Committee, in their interim Report, have stated as under:—

> "The Committee are not certain whether the consideration of a gas grid is within their terms of reference. Whereas the introduction to the resolution on the Constitution of the Committee no doubt states that such a proposal is under consideration of the West Bengal Government, this task has not been specifically enjoined in

> the terms of reference (Vide VI of the terms of reference). This aspect has however been considered by the Committee since it has been indicated as an integral part of the first phase of the scheme. The Committee have not yet been able to examine it in detail and, its conclusions would therefore be embodied in the final report."

91. It is understood that the report of the Consultants on the gas grid has just been received and that it would take some time for the West Bengal Government to examine it. Further, having regard to the industrial demands in prospect to which we referred earlier, and which are stated to be under negotiation, it is not clear whether there would be enough gas left for being transported to either Chittaranjan area or to Calcutta. In view of the uncertainty thus existing and the fact that the terms of reference have not specifically called for its examination, the Committee have not reported on this issue. Considering the fact that the Coke oven gas would get a higher price in its use as an industrial raw material the returns from the Coke Oven Plant could be expected to be more attractive should there be such outlets. If the entire surplus gas could be marketed in the vicinity for industrial uses instead of being fired under the boilers and an average price of 10 annas per 1000 cu. ft. is assumed, the returns could go up by another Rs. 9·0 lakhs. But no assessment of the additional credits from industrial uses of coke oven gas can be made at this stage on any firm basis

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SECTION VIII

ORGANISATION AND MANAGEMENT OF THE COKE OVEN PLANT

92. The final decision on the choice of appropriate form of organisation and management for this project would naturally rest with the State Government. The Committee noted the recommendation made on the subject of organisation of industrial undertakings in the public sector by the Planning Commission in the First Five Year Plan and the latest office memorandum of the Ministry of Finance, an extract from which is reproduced below.

> Government owned and managed undertakings.
>
> Such undertakings are at present being treated as normal adjuncts of Government Machinery and supplies of services rendered to them by Government Departments are not charged for. Unless the accounts of these undertakings are maintained on strictly commercial lines, it is not possible to have a correct assessment of their working. The Public Accounts Committee have in paragraphs 7 and 87 of their report on the accounts of 1947-48 (post-partition) recommended that the accounts of such schemes should be maintained on more or less commercial principles in order to assess whether the enterprises are being run at a loss or profit. It has, therefore, been decided, in consultation with the Comptroller and Auditor General of India, that:
>
> (1) all such schemes should be declared as commercial departments under Art. 59 of the Account Code, Vol. I;
>
> (2) the accounts in the case of all new schemes should be maintained on a commercial basis from their very inception; and
>
> (3) in the case of the existing schemes, action should be taken to maintain accounts on a commercial basis with effect from the commencement of an agreed financial year, *i.e.*, from 1955-56 onwards.

93. The Committee endorse the view of the Planning Commission and the Ministry of Finance set forth above for the consideration of the West Bengal Government.

SECTION IX

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

94. The main conclusions and recommendations of the Committee are summarised below:—

(1) The demand within the country for hard coke in 1953 was estimated at 462,478 tons. The estimated demand for hard coke by 1960, exclusive of the requirements of the steel works and their subsidiaries and the Sindri Fertilizer Factory, would be about 875,000 tons of which 831,000 tons would be for sized coke. The increase in requirements is expected to arise mainly from foundries, Mysore Iron & Steel Works, soda ash, sugar, calcium carbide and ferro-manganese industries (Paras 22,44 & 45).

(2) Of the total demand by 1960, about 100,000 to 110,000 tons of hard sized coke would have to be of a grade required in ferro manganese and ferro alloys production, *i.e.*, with phosphorus not exceeding 0·05 per cent and ash below 20 per cent. A very special grade of another 15,000 to 20,000 tons of coke with phosphorus not exceeding 0.03 per cent. and ash below 12 per cent. would be needed for the production of calcium carbide, sodium sulphide and special castings (Paras. 46 and 59).

(3) No supplies of sized coke for the market could be envisaged from the steel works and the Sindri Fertilizer Factory with the exception of the Indian Iron & Steel Company, who have indicated a possible supply of sized coke during the period of the Second Five-Year Plan varying between 66,000 tons in 1955 to 44,000 tons in 1960, the supply in 1959 being nil (para 49).

(4) On the assumption that the renovation programmes furnished by the four private merchant cokeries in existence would be completed, their capacity by 1960 would be 307,000 tons per annum; a production of 269,500 tons of sized coke is expected from them in 1960. The supplies of sized coke from the Giridih Coke Ovens have been placed at 27,600 tons in 1960. The total availability of by-product sized coke from the existing sources indicated above (*i.e.*, private merchant cokeries, Giridih Plant and IISCO) is expected to be 341,100 tons in 1960. Including supplies of sized bee-hive coke estimated at 105,000 tons in 1960, the total domestic supplies of sized coke would come to 446,100 tons (paras. 55, 54, 59 and 57).

(5) The deficit in supplies of sized coke to be covered by the erection of additional coke capacity would amount to 384,900 tons. The tonnage of normal grade of sized coke would correspond to 250,000 to 270,000 tons of the total deficit, the balance being of special grades (para. 59).

(6) To investigate the question of appropriate locations for coke oven plants, the Committee would have had to study several aspects of the different coal fields and their coal, select several

possible areas and make a comparative study of the merits and demerits of each location before the most suitable location/locations could be indicated. The volume of work and the investigation that would be involved would take a considerably longer period for the Committee to complete such a study, if required. If the Planning Commission consider that such an investigation is required and it would be advantageous for them to have ready data on the subject for their further guidance, the Committee would like to suggest that separate arrangements for undertaking such an exhaustive enquiry should be made (para. 61).

(7) In the light of the position explained in para. (6) above, even while considering the question of location of the plant proposed by the West Bengal Government, the Committee were not able to discuss any location other than Durgapur. An examination of the several aspects relating to Durgapur reveals that facilities of quick transport towards Calcutta side from a four track railway system soon to be electrified, cheaper railway freight for coke compared to freight from Jharia etc., future availability of water transport through Durgapur canal towards Calcutta and places in between, cheap land, water supplies and a developed colony obtain at Durgapur which is also favourably situated in respect of availability of coal and power and the market of greater Calcutta. The Committee are, therefore, of opinion that taking the deficit into account, the Durgapur site is suitable for the location of the plant proposed by the West Bengal Government with a capacity of 292,950 tons of sized coke over 1" per annum (para. 63).

(8) The sections of the Durgapur scheme, whose economics have been worked out by the Committee comprise the following:

(a) Coke oven plant with a daily throughput of 1300 tons of coal and coke breeze (1235 tons of coal and 65 tons of coke breeze).

(b) Auxiliary plants for the recovery of by-products from coke oven gas (Ammonia, sulphuric acid, coal-tar, crude benzol and its rectified products).

(c) Coal-tar distillation plant with a daily input of 50 tons of coal-tar.

The fixed capital investment on the sections covered in the economic appraisal is estimated at Rs. 525 lakhs. The requirements of working capital have been estimated at Rs. 35·0 lakhs (paras. 69, 74).

(9) In calculating the credits, the Committee are of opinion that counting the potentialities for industrial development in Bengal-Bihar area, there would be a market for 500,000 gallons of benzene and corresponding quantities of other by-products of benzol rectification. The balance of crude benzol would have to be processed and sold as motor benzol. The surplus coke oven gas amounting to 8·18 million c.ft. of 450-460 BTU per c.ft. per day will be utilised in the beginning for firing the boilers of the thermal power plant of 30,000 kW capacity. The total credits from the sale of different products are estimated at Rs. 193.61 lakhs

as against manufacturing charges and provisions for depreciation and interest on working capital totalling Rs. 157·9 lakhs (paras. 64, 68, 83 and 85).

(10) The operating results show a return of 6·8 over the capital investment of Rs. 525 lakhs, the two items of preliminary expenses i.e. expenditure on project report and interest during the period of construction on any loan capital that might be secured, estimated at an extra Rs. 30 lakhs, being written off from profits gradually year by year, according to existing commercial practice. These items have not been provided for in computing the 6·8% referred to. The above return is visualised after providing for depreciation and interest on working capital, without providing for interest on fixed capital (para. 86).

(11) Having regard to the agreement entered into by the West Bengal Government and the Damodar Valley Corporation in January 1955 on the installation of a 30,000 kW thermal power plant by the latter, it is not considered necessary to assess the growth of load in the Bengal-Bihar area as required under the terms of reference. The installation of this power station provides an outlet for the by-product coke oven gas and thus improves the economics of the scheme (para. 68).

(12) Having regard to certain industrial demands in prospect near Durgapur, which have been intimated to the Committee by the West Bengal Government, it is not clear at this stage whether there would be enough gas for being transported to Chittaranjan area or to Calcutta. On re-examination of the terms of reference since the submission of the interim report, the Committee are of opinion that since they were only called upon to examine the possibilities of utilising coke-oven gas in the vicinity of a coke oven plant if established at Durgapur, it is not necessary for them to report on the proposals relating to the gas grid intimated by the West Bengal Government as part of the first phase of their Durgapur scheme (para. 91).

(13) The State Government, who have sponsored the Durgapur project, would naturally be the authority to decide on the form of organization and management for the project. According to the Committee, the operation of the project should be based on strict commercial principles. As regards organisation, the views expressed by the Planning Commission in the First Five Year Plan are endorsed by the Committee (paras. 92 and 93).

Shri S. V. Aiyer, Shri S. N. Ray and Shri R. K. Ramadhyani, have signed the Report subject to the attached explanatory notes.

D. C. Driver, Chairman.
R. K. Ramadhyani, Member.
Dr. A. Nagarajarao, Member.
S. V. Aiyer, Member.
S. N. Ray, Member.

K. Vyasulu, Secretary.

Dated May 7, 1955.

SECTION X

I. EXPLANATORY NOTE ON THE REPORT OF THE COKE-OVEN PROJECT ENQUIRY COMMITTEE

by Shri S. V. Aiyer

In the first instance, I must make it clear that this is not a minute of dissent, but is only intended to clarify certain aspects, which, I feel, have not been quite well appreciated in the Interim Report, or in respect of which perhaps it has not been possible for me to carry conviction into the minds of the other Members of this Committee. I, however, feel that I shall fail in my duty if I do not draw pointed attention of the Planning Commission and other authorities who will sit on judgment over the report to these aspects.

2. In my opinion, the economics of a bye-product Coke Oven Industry depend mainly on the demands for coke and next on the demands for gas. The volumes of the other products that will be produced by a Coke-Oven bye-products Plant are subject to the fluctuations in the rate of operation of the industry created by the demands for coke and gas. Once produced, the tar, oils, ammonia and other chemicals have to be disposed of. Though the returns to the industry from these chemicals are important, they are generally not sufficiently great as to justify the installation of a carbonising plant for their production. I feel they are the essential evils of setting up a bye-product coke-oven plant, and in discussing the economics therefor, great hopes should not be placed on high profits being earned from the disposal of such chemicals. Markets for the coke and the gas on competitive prices are essential to the success of a plant of this nature.

3. It is in the above background that the economics of the whole of the Durgapur Scheme have to be considered.

4. In the Report, the capital investment has been computed at Rs. 525 lakhs for a plant as modified by the Committee. As indicated in the report, this assessment does not include the following:—

(a) The share of the project expenditure which should be added to it, and which I assess, would be of the order of about Rs. 7 lakhs.

(b) If the capital has to be raised by a loan, on which interest payable at 4 per cent., I assess that during the period of construction, which may take about more than two years, the average period for the whole investment may be taken at about 12 to 18 months, and the interest charges that would be incurred during that period would be about Rs. 20 lakhs to Rs. 25 lakhs, which under the ordinary commercial practice, would have to be added to the capital.

(c) Items (a) and (b) above together will make a addition of about Rs. 30 lakhs to the capital assessed at Rs. 525 lakhs.

(d) It has already been pointed out in the report that the assessment of capital at Rs. 525 lakhs does not take into account the effect of an escalator clause that has been provided by the tenderers in their quotations. It is my considered view that it would not be correct to ignore this element, unless it can be established that wages levels and price levels of raw materials are on the decline. An argument has been advanced that the tendency of price levels of machinery etc., is to fall down. Price levels for manufactured products fall down inspite of increases in wages levels and price levels of raw materials for two reasons:—

(i) keen competition between the suppliers, reducing their own element of profit; and

(ii) reduction in the final cost on account of heavy increase in the loads in their Works, which more than compensates the increases caused by higher wages levels and higher prices of raw materials.

Therefore, simply because there is an indication of the price levels going down in the final fabricated or manufactured products, it should not be assumed that a tenderer, who has incorporated an escalator clause in his tender, would not have a claim under these clauses. The claims under these clauses have absolutely nothing to do with the price levels of the final products. If the experience of the Supply Department of the Government of India, both in India and in England, has any lessons to give, it is that in the present conditions of the industry in the world, when a tenderer has provided a clause of this nature, the purchaser should always expect a liability on this account. The only question that can be discussed is 'What is the extent of this liability?' I had assessed this liability at about 12·5% in my interim appreciation of the economics of this Project. This has been considered high by my colleagues in the Committee, and some of them were of the view that no provision at all is necessary. I do not feel that the provision I made was high. I also do not agree that no provision need be made for this element. Even if a minimum of 5% is provided for this, it would come to about Rs. 26 lakhs.

(e) I also feel that sufficient provision has not been made for all the services and supplies which have to be given free of cost by the West Bengal Government.

(f) Taking all these factors into account, I do not consider that an assessment of the capital expenditure, without the provision for working capital for this Project, at about Rs. 6 crores would be anywhere on the high side

Rate of Production

5. In the assessment of the rate of production in this plant, it has been assumed that the whole plant will work for 350 days in the year at 100% capacity. 350 days in the year represent 95·9 or 96

per cent. roundly of the number of days in the year, and therefore 96% capacity production has been assumed. It is my considered view that to assume that the plant will continue to produce at 100 per cent. efficiency for 96% of the days in the year is something too high, and if I may be permitted to say so, extraordinarily high to base upon, for the study of the economics of the whole scheme.

6. The published statistics of the Bureau of Mines in the United States give the following figures about the operations of Coke Ovens in that State. The operation ratios in the coke ovens, generally to the maximum capacity available, were on the average as follows:—

1937	78·8%
1939	69·0%
1943	95·7%
1945	84·3%
1946	73·8%
1948	92·0%
1949	79·7%
1950	90·0%
1951	96·5%
1952	84·0%

Over 10 specified years, to which the above statistics relate, it will be seen that it is only in two years, *viz.*, in 1943 and in 1951 that the figures were anywhere of the order of 96%. It was of the 90% or higher level, in four years. It was between 80% and 90% in two years, and it was below 80% in four years. If these figures are of any value, to study the general results that could be obtained by operating the bye-product coke-oven plant on a long range view, and in guiding the study of the economics of this scheme, I would submit that no more than 85% of the capacity should be taken up as working at 100% efficiency in the calculations to be made. This is necessary to provide for a loss in the number of working days that would result in any plant for various reasons, and also the impossibility of getting 100% efficiency continuously for all the time the plant works.

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7. If this view is accepted, it would be clear that the quantities of output of the various products taken into account in the above Report for assessing the economics are very high. It is true that, when an 85% of the maximum capacity is assumed for working, there will be a certain amount of savings in the out-of-pocket expenses that will be incurred during this period, as compared with the expenditure that would be incurred on the working of the 96% capacity. The difference however, in the surplus receipts will not be a proportionate affair, but will be of a lower ratio, when the plant works at average 85% capacity.

8. It might be argued that the manufacturers of the plant guarantee the higher rate of output to be obtained. This guarantee is generally for a short period of the working of the plant in the initial stage. Any plant can be pushed up to produce more than it can ordinarily be expected to give, for a short time, say about 6 months. Further, in the initial stage, it should produce more than what it would with age. In the study of the economics of a plant, the normal rate only can be taken and not more, and this should be based on the past experience in other plants.

9. In paragraphs 6 to 8 above, it has been pointed out that the rate of output assessed in the Report on the basis of the plant working for 350 days in a year at 100% efficiency, is too high a rate of output, and should not be taken into account in assessing the economics of the scheme. It is now necessary to consider the rates of yield of the several products themselves as adopted by the Committee, apart from the question of the rate of operation of the plant referred to above.

10. Motor benzol, Benzene, Toluene, Solvent Naphtha, Xylene, are items of products obtained on the rectification of crude benzol extracted from the gas. In determining the quantum of output of these several products, it has been assumed that it will be possible to obtain a yield of 3·7 gallons of crude benzol per ton of coal carbonised. In the interim Report, Dr. A. Nagaraja Rao, Chief Industrial Adviser, Ministry of Commerce & Industry, has made his observations on this aspect. In my investigations into the working of the Benzol Toluene plants already established in this country, I noticed that the yield of crude benzol has been only of the order of about 1·3 to 1·7 gallons per ton of coal carbonised. I also understand that in recent laboratory researches carried out by one of these plants, using activated charcoal as an absorbent (this was considered to be a more efficient absorbent) only a crude benzol content of 2·17 gallons per ton of coal carbonised, was established. It is considered that this is the maximum extent to which crude benzol could be extracted and no more. In view of all these aspects, to provide for a recovery of 3·7 gallons of crude benzol per ton of coal carbonised, would appear to be too optimistic, if it is not to be characterised as unrealistic. In view, however, of the assurance given by Dr. Lahiri, Director of Fuel Research Institute that recovery of 3·7 gallons of crude benzol per ton of coal carbonised, is a certainty, and since Dr. A. Nagaraja Rao would appear to be inclined to accept that rate of output as obtainable at least theoretically, it is difficult to further challenge this figure. But, all the same, it is necessary for me to emphasise that this is a maximum rate of recovery at maximum efficiency, and in studying the economics of a scheme, it would be dangerous to proceed on assumptions based thereon. Giving due weight to these expert opinions, I feel that it should be married properly with the practical results obtaining in this country and a more proper assessment of the economics of the scheme should be fairly made on the basis of about 2 gallons of crude benzol per ton of coal carbonised, instead of 3·7 gallons as adopted by the Committee. Incidentally, I understand that the Benzol Committee who assembled some time before also were of the view that for practical purposes the rate of 2 gallons per ton of coal carbonised should be taken.

Wash Oil

11. In the estimates of output made by the Committee, on the basis of 96 per cent. of the maximum capacity working at 100 per cent. efficiency, it has been assumed that about 1,900 tons of Wash Oil would be manufactured and credit therefore has been taken at Rs 450 per ton. I have my very serious doubts whether this

product will find a market in India at the rate quoted. With the small knowledge I possess, I understand the Wash Oil is used only for the purpose of scrubbing the gas in the process of extracting benzol therefrom. Plants for extracting benzol at present exist at five places, viz., Tatanagar, Hirapur, Kulti, Giridih and also at Bararee. New plants are planned to be installed at the Hindustan Steel Works at Rourekela and also at the Steel Works at Bhilai. So far as these two steel works are concerned, my knowledge is that they will produce their own wash oil from their own coke oven and bye-products plants, which they propose to instal. Whether they too will have a surplus quantity of wash oil to dispose of, is matter to be yet known. Giridih has a contract with M/s Shalimar Tar Products to purchase the wash oil required by them, and in this case, if the Giridih coke-oven plant is going to dwindle down to a production of only 27,000 tons of coke in a year by 1960, as has been assumed in the report, perhaps the requirements of Giridih for any wash oil will cease. The only plants to whom the Durgapur Project could expect to sell their wash oil within this country would therefore, be, of Messrs. Tata Iron and Steel Company Ltd., and Messrs. Indian Iron & Steel Co. Ltd, I, however, gather that the layout of the benzol extraction plants in these two concerns, specially provide for the use of Petroleum wash oil and it will not be possible for them to use wash oil extracted from the coke oven plant. It is also stated that considerable changes will have to be made in these two plants, if it is decided to use the indigenously produced wash oil from coke ovens. This question has already been discussed in the past and the proposition of using wash oil produced from the coke oven plants has been given up. In these circumstances, it is not possible for me to visualise that the wash oil of about 1,900 tons to be produced in the proposed Durgapur plant will have any market in this country, unless the Government of India decide to export this product, for which I am not certain they have any market; and if they have, what value they will be able to realise is a further problem. It is my considered view, therefore, that the 1900 tons of Wash Oil referred to above will have to be sold within India only, as fuel oil and no more, if possible, in which case, I don't expect that the Project will be able to realise anything more than about Rs. 100 to Rs. 150 per ton. Further, it is understood that, of late, as a result of research study made by the oil company at Digboi, necessary quality wash oil has been manufactured by them for use by Tatas, and perhaps by IISCO too. This is, therefore, no more a foreign product. It is an indigenous manufacture and will have to find a market. It has further been anticipated in the Report that this wash oil might be used in the new steel plant in Bengal-Bihar area, in the expansion schemes of TISCO and IISCO and in the Carbonisation Plant under the Niveli Lignite Project. All these projects are still, in their very initial stages and in my view, it is too premature to assume that they will definitely use this product, when they are established. It is my considered view that in working out the economics of the Durgapur Scheme it should be based not on assumptions of such possibilities but on more definitely known facts. If in due course, the expectations of the Committee turn true, so far so good.

12. While dealing with Fuel Oil, perhaps it is necessary to point out the further difficulties that would arise. With the three Refineries in India functioning in full, before the end of the Second Five Year Plan (two of them have already come into production), I understand that there will be oils which are extracted in the several by-product coke oven plants that will be established in the Steel Works and also in the Durgapur Project plant, not to talk of the oil which is being produced in Messrs. Shalimar Tar products at present. With so much of fuel oil becoming surplus in this country itself, one should pertinently ask the question to what extent we will be able to keep up the price of Fuel Oil at a level, which would ensure a reasonable realisation to the Durgapur Project, for all the oil it would produce so as to finally make it a profit-earning concern. In my opinion, in discussing the economics of the Durgapur Project, one should visualise that products such as oils, etc. will be disposed of at their costs of production and no more.

13. Apart from the above, I also find that with reference to the Rate Contract No. SC-1/RC-3859/3790/Shalimar, dated 27th July, 1954, for the year 1st July, 1954 to 30th June, 1955, entered into by the D. G. (S & D) with M/s Shalimar Tar Products (1935) Limited, the rate they have quoted for Cressote. Oil (for Coal Tar) suitable for Benzol extraction to I.S.D. Specification G/Misc-93 is Rs. 13-14-0 per cwt. marked f.o.r. Lodna, bulk loaded into tank wagons, which gives a rate of Rs. 277-8-0 only per ton. This is the rate paid by the Coal Commissioner for the indigenously produced Wash Oil. Even for the new superior Wash Oil to be supplied by Messrs. Burmah-Shell to M/s Tatas from Digboi, the rate is Rs. 1-10-0 per gallon delivered at Tatnagar or about Rs. 400 per ton and no more. For the Wash Oil that was supplied to M/s Tatas and M/s IISCO in the past, the delivered cost was of the order of Rs. 1·25 per gallon or about Rs. 310 per ton. In view of these also, I am not convinced that the rate of Rs. 450 a ton adopted by the Committee is justifiable.

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14. In this connection it has been pointed out that the Fuel Research Institute are engaged in a research to determine the quality, etc., of wash oil that should be produced from the coke ovens, so that they may be effectively used in the coke oven plants in place of petroleum wash oil. It is also claimed that the quality of such product will be superior to the petroleum wash oil now in use and it would result in higher yield of benzol, and thus in greater economy. If this be so, it would improve the economy of the plant. But I feel that it would not be justified on my part to assume the anticipated superior results, as established facts, at this stage for deciding the economics of the plant. I should be guided only by practical data available.

15. In the light of the aspects discussed above, I am not quite confident that the conclusions recorded in the Committee's Report, that the first stage of the Coke Oven Plant scheme, under which all the surplus coke oven gas will be supplied to the thermal plant at 5 annas per 1000 c.ft., would produce such a huge surplus of the order of about Rs. 35·71 lakhs or a return of about 6.8% on the investment of Rs. 525 lakhs could be accepted without question.

Assuming average efficiency in the various production departments of the concern, and not being very optimistic of ideal maximum efficiency attainable, it is quite possible that the scheme, as envisaged above, would be able to meet its revenue expenditure from its revenue earnings, and also provide for the depreciation element on the fixed assets. Even, if one wants to take a slightly more optimistic view of things, small surplus of upto ·3% may result on the capital invested, which may be absorbed towards the payment of interest, if the capital is to be a loan.

16. I have already pointed out above in the beginning of these notes that the economics of a bye-product coke-oven industry mainly depend upon the returns it would get from coke and the use of gas. If the Durgapur Scheme is able to find out more profitable outlet for its surplus gas than its consumption in the thermal plant, then the Scheme is bound to prove a satisfactory success and might yield a more satisfactory return on the capital invested. According to the sponsors of the scheme, they expect the development of a chain of industries in and around Durgapur in due course, which would eventually give them a very good market for the consumption of their surplus gas. They also have proposals to transmit the surplus gas through a grid both to Chittaranjan and to Calcutta, to find more profitable outlets. With the development of industries along the line from Durgapur to Calcutta, it is quite possible that the expectations of the sponsors of this scheme might come true. On this assumption and with the hope that the transmission line will work economically and successfully, one may concede that the coke oven project sponsored by the West Bengal Government may finally end in a successful venture.

17. The economics of the Gas Grid Scheme sponsored by the West Bengal Government have not been discussed by the Committee and therefore it is not possible to say anything definitely on the economics of it.

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II. EXPLANATORY NOTE ON THE REPORT OF THE COKE-OVEN PROJECTS ENQUIRY COMMITTEE

by

Shri S. N. Ray

During discussions of the draft Report, Shri S. V. Aiyar, a Member of the Committee, agreed to sign the Report subject to what was termed as an Explanatory Note, though not a Minute of Dissent. All the points raised by Shri Aiyar were fully discussed in the Committee but, in view of Shri Aiyar's Explanatory Note, I feel that, unless certain further explanations were given, the Planning Commission and other authorities sitting on judgment over the Report may get the impression that some of the points raised by Shri Aiyer were not thoroughly gone into or fully appreciated. It is for this reason that I feel incumbent to sign the Report subject to this Explanatory Note.

In paragraph 2 of his Note, Shri Aiyar has termed coal-tar, oils, ammonia and other chemicals as "essential evils of setting up a bye-product coke-oven plant." This may be so in the case of a steel plant whose main concern is to produce coke for utilisation in making iron and steel and the bye-products other than coke produced by the plant may be undesirable but inescapable items; but when it is contemplated to establish coal-tar-based chemical industries these products are actively desired for the purpose and are certainly not "essential evils."

Paragraph 3. No remarks.

Paragraph 4. In this paragraph Shri Aiyar has tried to show that the capital at charge should be Rs. 6 crores, as against Rs. 5 crores calculated by the West Bengal Government and Rs. 5·25 crores accepted by the Committee. As the increase of Rs. 25 lakhs suggested by the Committee over West Bengal's figure of Rs. 5 crores was reasonable and comparatively a small figure, the increase was accepted by the West Bengal Government, though, strictly speaking, the capital at charge should be nearer Rs. 5 crores, as originally computed by the West Bengal Government and as shown below.

Capital	(Rs. lakhs)	
Site clearance, etc., Office Buildings & Colony	60	
Factory building	125	
Plant & Machinery	325	
	510	
Customs duty on imported items	11	(Rs. 200 lakhs worth of plant are to be imported).
	521	
Contingencies @ 5%	26	
Total	547	

Deduct —	(Rs. lakhs)
Cost of the Ammonium Sulphate plant	22·3
Customs duty @ 5½%	1
	23·3
Contingencies@5%	1·1
Total for Ammonium Sulphate Plant	24·4
Due to reduction in the size of the Tar Distillation Plant to 50 tons/day instead of 100 tons/day	25*
Total reduction	49·4
Original Capital cost	547
Reduction	49·4
Total	497·6
Additional cost of Ammonia cylinders	5†
Grand Total	502·6

Shri Aiyar has again reiterated that a fairly heavy amount should be provided for the escalator clause. This point was discussed in detail by the Committee and they were satisfied that, as an escalator clause is merely a safety clause for both the purchaser and the seller, its provision in the tender specification should not push up the capital estimate of the Project. The Committee, however, wanted that 5% of the capital at charge, might be provided as "unforeseen contigencies" which was accepted by the West Bengal Government.

An escalator clause is assumed by Shri Aiyar to inevitably mean a heavy increase in the ultimate capital cost. It must be pointed out that should prices decline the existence of an escalator clause will lower the capital costs and in view of the tendency towards a general fall in prices, it is not likely that the capital cost would go up to any appreciable extent because of the existence of such a clause. What incidence an escalator clause will utimately have will depend on the type of escalator clause finalised by the West Bengal Government with the successful tenderer. The German Consultant has explained to the West Bengal Government that depending on the mode of payment finally agreed upon, an escalator clause will in practice mean little or no additional expenditure. In any case there is no justification for pushing up the estimate of a project simply because in the tender specification there is provision for an escalator clause.

As already explained to the Committee and accepted by them, there is no justification whatever to increase the capital to Rs. 6. crores, as against Rs. 5·25 crores decided upon by the Committee.

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*In view of the small quantity of tar to be distilled, ordinary Batch still plant costing about Rs. 8 to 10 lakhs would suffice instead of the complicated pipe still, costing about Rs. 35 lakhs.

†While the cost of Ammonia cylinders has been taken in the capital cost, credit has been taken only for the sale of Ammonia and no credit has been given for the hire charges of the cylinders which are considerable and which according to trade practice are paid by the buyer over and above the price for Ammonia which has been taken into the income side.

Paragraphs 5, 6, 7, 8, & 9.—This question of rate of production was also thoroughly discussed by the Committee. It was explained to the Committee by the West Bengal Government's representative that their Consultants had advised to take 350 working days in a year for financial computations. The Consultants had explained that, though the Coke Oven Plants could not be allowed to cool down and had normally to work for 365 days in a year, for financial computations, usually, 350 days are taken as the number of working days in a year. They further pointed out that, in several years, they worked their Coke Ovens at 110% of the installed capacity when there was a greater demand for the products in the market. Every plant has an overload capacity ranging from 10 to 20%. In the Durgapur plant, heavy stand-by capacity has been provided for each section of the plant so that there may be no difficulty in achieving the average rating taken for financial computation.

The operation ratios given by Shri Aiyar from the statistics of the Bureau of Mines in the United States do not furnish any explanation why the plants did not work up to 95% to 96% of their capacity in some years though they did not work to that capacity in a certain number of years. The fact that the average performance of all the ovens in the country (including old and new ovens) reached in certain years 96% of the rated capacity, individual ovens, particularly the new ones must have worked above 100% of the rated capacity. Coke ovens are not worked to full capacity when there is no demand for the products in the market. Moreover age of the ovens also affects production. Low percentages of operation in particular years need not necessarily mean that the Coke Oven could not work to a higher percentages in these years.

Paragraph 10.—Production of Benzol and its derivatives was thoroughly discussed by the Committee and the paragraph 16 of the Interim Report was revised by Dr. Nagaraja Rao after a full discussion with Dr. A. Lahiri, Director of Fuel Research Institute. It is not understood why the same point has been again raised by Shri Aiyar in this paragraph. In a technical question like this, it is the opinion of the experts which should count in preference to that of lay men.

Paragraphs 11, 12, 13, and 14.—The question of disposal of wash oil was also thoroughly discussed by the Committee with experts like Dr. Lahiri and Dr. Nagaraja Rao. Wash oil is not at present being manufactured in the existing coke ovens to any appreciable extent and is mostly imported. The fact that the third Steel Plant to be put up with the help of the British experts for the Bengal/Bihar area will be located at Durgapur or within a reasonable distance of it would justify the conclusion that the entire production of wash oil of Durgapur Plant will be consumed by the new Steel Plant since, during discussions with the British experts, it was understood that the new Steel Plant will not carry out any coal-tar distillation in their Plant.

Paragraph 15.—In this paragraph Shri Aiyar has expressed doubts about the return of about 7% on the capital invested. In his financial appreciation of the Durgapur Project which he originally submitted to the Committee he came to the conclusion that the Project will barely meet the operation and depreciation charges and will fail to meet the interest charges after assuming the operational cost of the bye-product coke oven plant at Rs. 62 lakhs. This figure was drastically reduced by the Committee to about Rs. 40 lakhs which was accepted by Shri Aiyar. In his Explanatory Note Shri Aiyar doubts the wisdom of accepting the figure of the Committee though he agrees reluctantly the Project might just pay its way.

It may be pointed out that the operational cost of the bye-product coke oven plant to be installed at Durgapur, as worked out by detailed analysis by our Consultants comes to about Rs. 8·5 per ton of coke, excluding interest and depreciation and Rs. 18·5 per ton including operation and amortisation charges. Adding the cost of coal @ Rs. 19/- per ton, the cost of coke comes to Rs. 29/- + Rs. 18·5=Rs. 47.5 against the selling price of Rs. 34-12-0. This cost includes the operational costs of bye-products also, such as road tar, benzene, etc. With Shri Aiyar's computation the position is as follows:—

Cost of operation (annual)	Rs. 62 lakhs
Depreciation ,, ...	30
Interest ,, ...	20
	Rs. 112 lakhs to make 3 lakhs tons of coke
or	Rs. 37 per ton.

Adding the cost of coal @ Rs. 19/-, the cost of coke comes to Rs. 29 + Rs. 37 = Rs. 66 per ton against the selling price of Rs. 34-12-0. The corresponding figure with the operational cost of Rs. 40 lakhs assessed by the Committee comes to Rs. 59/- per ton of coke. Even though the operational cost of Rs. 40 lakhs assumed by the Committee is on the high side, yet taking into account reasonable returns by sale of bye-products, a Coke Oven Plant of the type proposed by the West Bengal Government will be an economic success, but if the operational costs are further increased, as suggested by Shri Aiyar, then it would be only uneconomic to establish a Coke Oven Plant anywhere in India. This position is obviously absurd for the reason that Coke-Oven Plants are operating successfully in Germany where the disparity between the price of coal and coke is very small, whereas in India the price of coke is hundred per cent. over that of coal. If a coke oven plant can be operated profitably in Germany, any calculations by which it is sought to prove that such a plant would be uneconomic in India must be rejected straight away.

The credit given to the Coke Oven Plant for the products by the Committee has been at rates below the present prevailing market price of the commodities as explained by the Committee in their Interim Report. To push down these credits further as suggested by Shri Aiyar in this note and to push up the working expenses would not lead to a correct financial appreciation of the bye-product Coke Oven Plant. It may be pointed out that the return of 7% on the capital investment has been arrived at by assuming that all the surplus coke oven gas would be burnt in the Thermal Plant at -/5/- annas per 1000 c.ft. whereas quite a substantial portion of the gas will be given to the Grid at Re. 1/- per 1000 c.ft. and almost an equal quantity would be given to industrial concerns near about Durgapur at about 10 to 12 annas per 1000 c.ft. Consequently, the expected return from the sale of gas would be more than double the amount taken as credit by the Committee.

Even if a reasonable anticipated credit is given for the sale of gas alone, there cannot be any doubt about the financial success of the Project as pointed out by Shri Aiyar himself in paragraph 16 of his Note.

Financial appreciation should not relate to the first one or two years of operation but to the period when the production and the market will have been stabilised. From that perspective there can possibly be no doubt about the financial success of this integrated Project. It should not also be forgotten that the public sector is not out to make big profits. If it can open up new avenues of industrialisation affording employment to the people without incurring any loss to itself but creating additional wealth, at the same time then it has achieved its object.

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EXPLANATORY NOTE

by

Shri R. K. Ramadhyani

In paragraph 9 of the Report it has been stated that it came to the Committee as a surprise that the Planning Commission accepted the request of Central Water and Power Commission for the withdrawal of Shri G. S. N. Raju from the membership of the Committee. The wording of this paragraph reads to me unfortunately like a criticism of the Planning Commission which I feel it necessary to clarify as apparently it was not intended.

2. In the assessment of the demand of coke by the Committee in paragraphs 22 and 43 of the Report, the estimated consumption by Foundries has been put at 96,050 tons. This figure was arrived at from the quantity of pig iron consumed by Foundries. The exact figure of the demand and consumption of Foundries is not available. The Memorandum of the Indian Foundries Association puts the demand at 142,800 tons. Since the assessment of the demand of hard coke has been worked out from the present demand, the correct way would be to deduct the corresponding demand of the Foundries. Since that has not been possible, the assessment of the demand of "other consumers," by deducting from the overall demand the estimated consumption of Foundries may result in a figure of total demand which is on the high side.

Since the demand for "other consumers" in 1953 has been treated as remaining stationary even in 1960, and since it is likely that with greater industrial development this demand is likely to increase, the error in respect of the demand for foundries is compensated by the omission to provide any increase of the demand by "other consumers". Thus the gap between production and demand as calculated is not materially altered.

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APPENDICES

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APPENDIX A

LIST OF VARIOUS BODIES ADDRESSED BY THE COMMITTEE FOR DATA

I. Producers of Coke.

* 1. Tata Iron & Steel Co.
* 2. Indian Iron & Steel Co.
* 3. Hindustan Steel Ltd.
* 4. Hard Coke & By-Products Producers Association.
* 5. Giridih Coke Oven Plant, Ministry of Production, New Delhi.
* 6. Lodna Colliery Co. (1920) Ltd.
* 7. Barrakur Coal Company Ltd.
* 8. Bhowra Coke Company.
* 9. Bararee Coke Company.
* 10. Sindri Fertilizers & Chemicals Ltd.
* 11. Director General, Ordnance Factories (as producer of benzene, toluene, etc.).
* 12. Oriental Gas Company Ltd., Calcutta.
* 13. Bombay Gas Company, Bombay.
* 14. Bhowra Kankanee Collieries Ltd., Calcutta.

II. Electric Power.

* 1. Damodar Valley Corporation, Calcutta.
* 2. Eastern Railways Administration, Calcutta.
* 3. Sindri Fertilizers & Chemicals, Sindri.
* 4. Chief Engineer, Electricity, Govt. of Bihar.

III. Associations of Consumers and Individual Industrial Consumers of hard coke, organic Chemicals (benzene, toluene, etc.) and Road Tar.

(In this list, the names of parties mentioned in Appendix II have not been repeated)

Associations

* 1. Indian Foundry Association, Calcutta.
2. Indian Sugar Mills Association, Calcutta.
* 3. The Millowners Association, Bombay.
* 4. The Ahmedabad Millowners Association.
5. Southern India Millowners Association, Coimbatore.
6. Bengal Millowners Association, Calcutta-1.
* 7. All India Distillers Association, New Delhi.
* 8. Fan Makers Association of India, Calcutta.
* 9. Employers Association of Northern India, Kanpur.
10. Indian Lamp Factories Association, Calcutta.
11. Federation of Electricity Undertakings of India, Bombay.
* 12. Bengal Glass Manufacturers Association, Calcutta.
13. Cycle Manufacturers Association, Calcutta.
14. Indian Paper Mills Association, Calcutta.
* 15. Indian Paper Makers Association, Calcutta.

16. Engineering Association of India, Calcutta.
* 17. Indian Engineering Association, Calcutta.
* 18. Paint Federation, Calcutta.
* 19. Indian Paint Manufacturers Association, Calcutta.
* 20. Indian Chemical Manufacturers Association, Calcutta
* 21. Tar Producers Association, Calcutta.
* 22. Coal-Tar Distillers, Association, Calcutta.
23. Vanaspati Manufacturers Association of India, Bombay.
24. Indian Pump Manufacturers Association.
25. Indian Electrical Manufacturers Association.
26. Steel Re-rolling Mills Association of India, Calcutta.

Individual Units of the Industry

* 1. Hindustan Insecticides Ltd.
* 2. Atul Products Ltd. (a).
* 3. Alkali & Chemical Corporation of India (a).
4. Shalimar Tar Products (1935) Ltd., Calcutta.
* 5. Hindustan National Glass Manufacturing Co. (b).
* 6. Hindustan Pilkington Glass Works.
7. Bengal Ingot Co. Ltd., Calcutta.
8. Bombay Metal & Alloys Ltd., Bombay.
9. Ganga Metal Refining Co. Ltd., Calcutta.
10. Indian Smelting & Refining Co. Ltd., Bombay.
11. Jaipur Metal Industries Ltd., Jaipur.
12. Metallica Works, Worli Road, Bombay.
13. Annapurna Metal Works, Calcutta.
14. Hindustan Metal Works, Hathras.
15. Bharatia Electric & Steel Co., Calcutta.
16. Travancore Electro-Chemical Industries, Kottayam.
17. Industrial Chemicals Ltd., Talaiyuthu.
18. Mysore Paper Mills, Bhadravathi.
19. Scientific Indian Glass Co. Ltd., Calcutta.
20. Jeypore Mining Syndicate Ltd., Madras.
* 21. Kalinga Ferro Alloys Ltd.
22. Electro Metallurgical Works Ltd., Bombay.
* 23. Bengal Chemical & Pharmaceutical Works Ltd., Calcutta.
24. Alembic Chemical Works, Baroda.

IV. Government Departments.

1. Ministry of Production regarding Madhya Pradesh Steel Plant.
2. Ministry of Railways (Roads Organisation) Road Tar.
3. Iron & Steel Controller, Calcutta—Demand for pig iron.
4. Coal Commissioner, Calcutta—Statistics of production of coke and existing demand for hard coke.

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*Reply received.

(a) Furnished data regarding requirements of benzene, toluene, etc.

(b) Furnished information regarding requirements of coke-oven gas.

APPENDIX B

Data on consumption and future requirements of Hard Coke furnished in response to the Questionnare.

	1951	1952	1953	1954	1955	1960
Metallurgical Industries						
1. Indian Aluminium Company	1,578	1,346	1,522	2,540	33,90	1,140
2. Aluminium Corporation of India	350	210	195	50	500	500
3. Metal Corporation of India	619	800	891	1,476	2,500	4,800
4. Mysore Iron & Steel Works	17,000	20,000	21,000	21,000	4 ,000	60,000
5. Cambata Industries Ltd. (Ferro-manganese)	..	..	..	..	..	21,000
6. Mukund Iron & Steel Works	688	467	527	508	600	600
7. National Iron & Steel Co.	..	..	..	1,000	..	7,480
Chemical Industries						
8. Tata Chemicals Ltd.	5,530	3,591	5,703	5,377	7,000	13,600
9. Dhrangadhra Chemical Company	2,461	1,878	2,251	1,923	7,260	7,260
10. Rohtas Industries Ltd. (Soda ash-cum-ammonium chloride project)	..	..	..	..	..	47,600
11. Mettur Chemical & Industrial Corporation Ltd.	13·4	14·8	19·0	17·6	20·0	20·0
12. Alkali & Chemical Corporation of India (*a*)	45	97	103	74	103	177
13. Birla Jute Manufacturing Co. Ltd. (Calcium Carbide)	150	110	100	100	5,500	5,500
Cement, Refractories and Potteries.						
14. Associated Cement Co.	3,555	3,000	3,000	3,200	3,900	3,900
15. Bengal Potteries (*b*)	12,468	12,260	14,387	14,500	15,000	24,000

16. Dalmia Cement (Bharat) (Ltd.) (*b*)	..	..	..	60	480	7,740
17. Orissa Cement Ltd. Rajanjpur	..	..	..	360	480	840
18. India Cements Ltd.	60	47	28	59	..	..
19. Patiala Cement Co.	246	176	142	143	210	220
20. Satna Stone & Limestone Co.	..	..	..	..	..	5,000
21. Reliance Fire Bricks & Pottery Co.	6·0	42·25	24·01	23·0	23·0	23·0
Engineering Industries						
22. Texmaco, Gwalior	1,080	1,171	1,394	964	1,000	1,200
23. Tata Locomotive & Engineering Co. Ltd.	416	342	352	360	500	500
24. Jay Engineering Co. Calcutta	1,134	985	1,162	1,356	3,360	7,200
25. Orient General Industries Ltd.	..	..	..	..	600	750
26. Cooper Engineering Co. Ltd., Satara	1,454	1,305	229	1,100	1,900	1,900
27. Godrej & Boyce Mfg. Co. Ltd. Bombay	..	178	160	110	300	360
28. Rashtriya Metal Industries, Andheri	45	34	31	34	50	50
29. Vasant Industrial & Engineering Works	134	83	174	173	175	175
30. Eyre Smelting Ltd., Calcutta	18	18	18	18	20	20
31. Saurashtra Engineering Corporation Ltd., Bombay	61	31	16	42	120	210
32. Investa Machine Tools & Engineering Co. Bombay	276	191	90	104	150	600
33. Premier Automobile, Bombay (*b*)	670	747	602	497	960	960

Data on consumption and future requirements of Hard Coke furnished in response to the Questionnaire—contd.

	1951	1952	1953	1954	1955	1960
34. Indian Standard Wagon Co.	2,804	3,633	3,442	4,572	4,572	4,572
35. Textile Machinery Corporation, Belghurriah Works	1,097	704	·712	1,044	1,560	3,300
36. Kirloskar Brothers Ltd., Satara	1,092	950	652	770	1,100	1,600
37. Indian Standard Metal Co.	16	16	15	15	15	15
38. Binani Metal Works	19		57	40	40	40
39. Hindustan Motors.	1	42	160	548	1,500	3,000
40. Indian Sugar & General Engineering Corporation	..	..	..	550	720	1,500
41. Kamani Engineering Corporation Ltd. & Kamani Metals & Alloys Ltd.	..	..	30	83	100	100
42. National Machinery Manufacturing Co.	78	931	1316	1,350	5,600	9,500
43. Kumardhubi Engineering Works	422	480	415	443	500	500
44. Standard Motor Products	..	..	..	66	96	180
45. Howrah Iron & Steel Works	57	97	65	46	70	150
46. Hind Cycles Ltd.	15	15	15	15	15	15
Miscellaneous						
47. Oriental Gas Co., Calcutta (a)	44	45	55	50	50	50
48. Britannia Biscuit Co., Calcutta (*b*)	..	625	660	470	400	400
49. India Paper Pulp Co., Nailati	70	70	70	70	70	70

50 Upper India Couper Paper Mills & Co., Lucknow . .	13	12	12	19	25	25
51. Orient Paper Mills, Sambalpur	..	90	90	90	120	240
52. Shree Gopal Paper Mills	16	37	118	57	125	125
53. Central India Spinning & Weaving Mills	29	25	38	22	Not	given.
54. Jagatjit Sugar Mills, Phagwara (Punjab)	137	250	179	183	363	468
55. Hindustan Sugar Mills, U. P.	62	28	49	36	65	80
56. Indian Jute Mills Association	5,400	5,400	5,400	5,400	6,000	6,000
57. Ahmedabad Millowners' Association	1,124	859	1,177	1,192	1,200	1,200
58. Millowners Association, Bombay	1,268	1,396	1,350	1,109	Not	given.
59. Hindustan Gas Company, Calcutta	1,042	740	665	800	300	800
60. Delhi Cloth & General Mills	705	368	492	706	1,000	1,000
61. Burma Lime Co.	160	160	185	210	225	275
62. Indian Sugar Mills Association	..		Not	given	23,000	35,000
63. Indian Sugar & General Engineering Corporation, Ambala .	..	..	..	550	720	1,500
64. Walchand nagar Industries Ltd.	..	..	..	..	300	400
65. Saraya Distillery	29	39	46	25	40	40
66. Hindustan Vanaspati Manufacturing Co.	2,966	3,050	2,836	2,882	3,600	4,200
Public Sector						
67. Indian Railways	..	..	..	..	45,043	49,555
68. Defence Ordnance Factories (*a*)	..	..	..	..	9,000	16,000

(*a*) Also furnished data regarding requirements of benzene, toluene, xylene, etc.
(*b*) Also furnished data regarding requirements of Coke-oven gas.

Firms which have reported that they do not use coke at all or that they use negligible quantities of Coke:

1.	T. I. Cycles of India	Nil
2.	Indian Steel & Wire Products	Nil
3.	Bombay Potteries & Tiles Ltd.	Nil
4.	National Newsprint & Paper Mills	Nil
5.	Machinery Manufacturers Corp. Ltd	Nil
6.	Stoneware Pipes (Madras) Ltd.	Nil
7.	Metal Box Company	Nil
8.	Bengal Paper Mills	Nil
9.	Travancore Titanium Products Ltd.	Nil
10.	Central Distillery & Chemical Works Ltd., Meerut	NIL
11.	Travancore-Electro Chemical Industries, Kottayam	Nil
12.	Star Paper Mills	Nil
13.	Bombay Metal Refinery	Nil
14.	Bengal Glass Manufacturers Association	NIL
15.	Sen-Raleigh Industries of India, Ltd.	Negligible
16.	Indian Copper Corporation	do
17.	Calcutta Flour Mills Association	do
18.	Indian Non-ferrous Metals Manufacturers Association	do
19.	Titaghuar Paper Mills	do

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APPENDIX C

I. THE HARD COKE & BYE-PRODUCTS PRODUCERS ASSOCIATION

1. The Hard Coke and Bye-Products Producers Association, Calcutta, represents the four market manufacturers of bye-product hard coke, namely

The Bararee Coke Co. Ltd.	Bararee Coke Works
The Bhowra Coke Co.	Bhowra Coke Plant
Lodna Colliery Co. (1920) Ltd.	Lodna Coke Plant
Burrakur Coal Co. Ltd.	Loyabad Coking & Bye-Products Recovery Plant

All these plants are situated in the Jharia Coalfield, and produce coke and bye-products from the carbonisation of coking coals drawn from nearby collieries. The last two plants named above are owned and managed by companies which also mine coal.

2. All four plants were built approximately 35 years ago and have been in continuous operation since. Throughout this period the managements have been responsible for the marketing of their products, both under conditions of free distribution, and also under the system of control which has been exercised for the past ten years under the Colliery Control Order. As a result their experience in these matters places the members of this Association in an excellent position to assess the hard coke requirements of consumers in India and abroad, both qualitatively and quantitatively. They are in daily touch with the market and maintaining close liaison with all classes of consumers.

3. We therefore propose to deal below with these two important aspects of the task which faces your Committee, namely the assessment of demand.

(a) **Quality:**

(i) The major portion of the market bye-product hard coke produced in this country is absorbed internally for in workshops and foundries. The ultimate consumers may be separate concerns manufacturing engineering products for the market, or they may be attached to other industries which maintain their own workshops, *e.g.* Posts and Telegraphs, collieries, jute mills, railways, etc. The only other important classes of consumer in recent years have been the steelworks and the Sindri fertilizer plant, which had at one time to supplement their previous arrangements by procuring quantities of coke for the market plants. This offtake was of a temporary nature, and is unlikely to recur. There is in addition a regular demand of some 2,600 tons monthly for the Mysore Iron & Steel Works.

(ii) Almost all these consumers require a hard, low volatile consistent coke with an ash content of not more than 24%, and with a minimum size of 2 inches. In our experience these specifications are met adequately by the coke currently being produced at our plants, and complaints from consumers are exceedingly rare. It is not correct—as has been alleged in some quarters that with the ageing of the plants the quality of the coke produced has deteriorated. It is admitted that old ovens produce a slightly larger proportion of rejections, but if these are excluded from the hard coke sold to foundries, and are marketed elsewhere the shape of soft coke or breeze (as is the current practice) then the quality of hard coke sold as such remains consistent. Moreover, the oven renovation programmes on which the plants are at present engaged—and which will be dealt with later—will in due course ensure the maximum recovery of Hard Coke No. 1 from the batteries, with the proportion of inferior production falling to its former level.

(b) **Quantity:**

(i) *Existing Demand.*—An accurate assessment of the present demand for bye-product coke is complicated by several artificial factors arising from the facts that coke is a controlled commodity, and that the country's railway transport system is not yet able to cope fully with the demands of industry. These factors may be summarised as follows:—

1. Some classes of internal consumer who would prefer to take bye-product coke are compelled by the Coal Commissioner to accept the inferior commodity manufactured in bee-hive and "country-type" ovens.
2. The export of hard-coke is also subject to control and restrictions imposed from time to time on the export of Indian coke have made it difficult to assess the scope of a market which is in any case spasmodic in character.
3. There are many small consumers, such as foundries, which do not have a regular demand, but which apply for coke procurement permits when their order books for finished articles justify the procurement of raw materials. Within the somewhat cumbrous framework of control and inadequate transport facilities it is not always possible for them to obtain the tonnage they want when they want.
4. As a result of the restrictive factors mentioned above, and also of the recent shortage of coke (which will be dealt with in detail later) consumers are understandably liable to exaggerate their requirements when answering official questionnaires issued in an endeavour to estimate demand. If a consumer has

been used to having his requirements cut by (say) 50%, or to 50% of his needs being diverted to beehive coke, then he will naturally inflate his demand when answering any official enquiry, in the hope of securing his actual requirement, even if the figure he gives is halved by the controlling authority. This is a very real factor and should not lightly be ignored.

How, then, is the existing demand for hard coke to be assessed? We submit that the experience of the market coke producers affords a solution to this problem. During the year 1953, the four market plants produced a total of 2,50,000 tons of hard coke, and it was found that while the plants were producing at this rate the existing markets, under control, were capable of absorbing this quantity, which, however, included no less than 6,450 tons despatched to the Sindri Fertilizer Factory. This particular demand has now disappeared, and in fact Sindri is expected to have an available surplus of hard coke produced in its own ovens of approximately 3,000 tons monthly which will be thrown on to the market for a period of unknown duration.

Early in 1954 the situation altered when, as the result of an illegal strike the No. 2 Battery at Lodna sustained damage through loss of heat and went temporarily out of production. It is now under repair and should come into full production in the second half of 1955 but the effect on the current situation is that the Association's joint output has fallen by some 4,000 tons a month. It was unfortunate that the other three plants were simultaneously engaged on oven repair programmes which inevitably restricted the rate of production, and it is only recently that these repair programmes have begun to show results in the shape of rising outputs. As will be seen, however, from the figures shown below, the current shortage of bye-product hard coke is only temporary, and it will not be long before the joint rate of production will rise to a figure in excess of that achieved in 1953.

Estimated joint annual production (tons)

1955	1956	1957	1958	1959	
228,000	285,000	305,000	308,000	308,000	308,000

N.B. 1.—As mentioned above, Lodna No. 2 Battery is at present under repair and estimates from 1956 onwards take into account full production from this Plant.

N.B. 2.—It will be seen that from 1956 onwards the 1953 production figure will be substantially exceeded, while the 1955 production should suffice to meet demand at the 1953 level, if Sindri's conversion from a consumer to a producer is taken into account.

Thus, if it accepted that the year 1953 (when production and demand were roughly equal) is a fair basis, then in 1955 there will be adequate bye-product hard coke available to meet the existing demand, and it may be hoped that the Coal Commissioner will be able in the coming year to lift the restrictions which were imposed upon certain consumers during the recent shortage.

(ii) *Potential Demand*

This Association is not in a position to estimate accurately the country's future demand for coke, depending as it does largely upon decisions to be made by Government regarding the establishment of large new industrial enterprises.

We do, however, consider that the expanded outputs at the members' plants should be fully capable of meeting any expected increased demands from our traditional customers both at home and abroad, for many years to come, particularly if bee-hive coke continues to be distributed to certain classes of consumer under the system currently in force. In fact it may well be that by 1956/57 the bye-product coke producers will find themselves going into stock unless they are permitted in the future to sell their product over a wider classification of consumers.

II. MEMORANDUM OF THE INDIAN FOUNDRY ASSOCIATION ON THE DEMANDS FOR HARD COKE

Estimated Demand for Hard Coke by the end of the First Five Year Plan

According to the Fifth Census of Indian Manufacturers (1950) published by the Directorate of Industrial Statistics, Ministry of Commerce and Industry, the consumption of Hard Coke in 1940 by 28 selected industries was 3,12,543 tons. Of this 1,62,520 tons were consumed by the Iron and Steel Industry followed by General Engineering and Electrical Engineering including Producer Gas Plant manufacture whose consumption was 86,400 tons. Other important consumers were Ceramics (11,400 tons), Chemicals (9,850 tons), Aluminium, Copper and Brass (9,132 tons), Sugar (9,800 tons) Vegetable Oils (6,060 tons) Cotton Textiles (5,060 tons). These figures relate to coke purchased by the consuming industries and not produced in the factory itself. Thus the coke consumed by Steel producers, *viz.*, Tata Iron and Steel Co. Ltd., and the Indian Iron Steel Co., who produce their own coke are excluded.

The combined consumption of Iron and Steel and General and Electrical Engineering, including Producer Gas in 1950 was 2,49,000 tons. Since then many of the Engineering industries have made remarkable progress. Unfortunately excepting Bicycles, Sewing Machines, Electric Lamps and Electric Fans, no separate consumption figures of the other Engineering Industries are available. It is, therefore, not possible to say precisely the percentage increase in production of these industries, by the end of the First Five Year Plan. These industries include items like Agricultural Implements and Machinery, Automobiles, Railway and Rolling Stock Machine Tools, Textile Machine, Ball and Roller Bearings, Hurricane Lanterns, Grinding Wheels, Dry Batteries, Storage Batteries, Electric

Cables, Electric Motors, Electric Transformers, Radio Receivers, etc., for all of which the Planning Commission has set targets. There are other industries which are not included in the Planning Commission's Programme. For instance Foundry Industry engaged in the direct consumer goods castings, is not at all included and this industry is perhaps the most important consumer of hard coke. Making a very rough estimate, however, it might be said that these industries will have increased their production by 40 per cent. by 1955-56 as compared to the 1950 level. The estimated coke consumption of these industries at the end of the First Five Year Plan (1955-56) should, therefore, be increased by 40 per cent. from 1950 consumption. The estimated consumption of other industries, based on the Planning Commission's estimate of production would be approximately as follows:

Industries	Coke consumption in 1950 (Tons)	Estimated increase in production by 1955-56 (Percentage)	Estimated consumption of coke in 1955-56 (based on estimated increase in production (Tons)
Iron & Steel (other than Main Steel Producers) and General and Electrical Engineering Industries	2,49,000	40%	3,48,600
Bicycles	400	500%	2,000
Sewing Machines	1,000	300%	3,000
Electric lamps	830	88%	1,500
Electric Fans	1,000	84%	1,840
*Ceramics	11,400	30%	15,200
Sugar	9,800	37%	13,400
Chemicals	9,800	100%	19,600
Aluminium and Copper . . .	9,100	350%	31,800
Vegetable Oils	6,000	20%	7,200
Cotton Textiles	5,000	38%	6,900
Cement	2,800	66%	4,80
Jute Textiles	2,300	34%	3,200
Paints & Varnishes	800	400%	3,200
Glass & Glassware	630	70%	1,100
Paper & Paper Board	300	77%	530
Other smaller industries	2,200	25%	2,700
	3,12,360		4,66,470

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The above assessment excludes the requirements of the Sindri Fertilisers Factory which was so long drawing its supply from the Indian Iron and Steel Co. Ltd. and which will henceforth produce its own coke. The estimated requirement of coke is bound to be higher than the above figure of 4,66,470 tons by 1955-56 for the following reasons:

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*Exact percentage not available.

(1) In the Census of Manufacturers 1950, details are available only for 28 industries whereas the Planning Commission has dealt with 41 industries in the Private Sector, besides some industries in the Public Sector. If all the industries are taken, the coke consumption figure is bound to be higher.

(2) In several cases there have been additions to the targets fixed by the Planning Commission. For instance, in the Cement Industry, additional capacity of 3 million tons is likely to be installed by the end of the Plan period; in the case of cotton textiles industry at least 1·05 million new spindles as against 8,50,000 envisaged in the Plan; in the case of Paper and Paper Boards 1,45,000 tons instead of 74,000 tons. Similarly greater additional capacity that was contemplated in the Plan is likely to be achieved in the case of Sulphuric Acid, Caustic Soda, Sugar, etc.

(3) Some important industrial projects not included in the Plan have since been consented to by the Government. They are (a) Manufacture of Industrial Explosives by Imperial Chemical Industries, (b) Manufacture of Dyes by Indian Dye Stuffs Industries Ltd. (c) Establishment of Heavy Steel Castings Foundry by Tata Locomotive and Engg. Co. Ltd., (d) Establishment of a 50,000 kW Termal Power Plant by Trombay by Tata Hydro Electric Agencies, etc.

(4) Assuming that the actual requirement of coke by the industries was higher than the consumption in 1950 the estimated requirement of the industries by 1955-56 which has been based on the 1950 consumption of coke, is bound to be higher.

Other things being equal, the estimated consumption of 4,66,470 tons by 1955-56 will have to be increased by at least 5 per cent. to cover the aforesaid contingencies. This will raise the total to 4,89,700 tons. To this must be added the estimated consumption of hard coke in the manufacture of Calcium Carbide, Ferro Manganese and Pig Iron (Electric Smelting Process at Bhadrawati) as follows:—

1. Calcium Carbide	8,000	tons
2. Ferro Manganese	45,000	,,
3. Pig Iron	15,000	,,
	68,000	,,

The total estimated requirement of Hard Coke by 1955-56 is likely to be in the neighbourhood of 4,89,000 plus 68,000—5,57,000 tons.

The position of production, despatch and export of bye-product and bee-hive hard coke during the past three years has been as follows according to the Coal Commissioner:—

	Production			Despatches			Export
Year	Bye-Product Hrad Coke (Tons)	Bee-hive hard Coke (Tons)	Total (Tons)	Bye-product Hard Coke (Tons)	Bee-hive Hard Coke (Tons)	Total (Tons)	
1952 .	276,711	111,396	388,107	268,160	120,806	368,966	18,133
1953 .	275,102	128,510	403,612	280,612	128,070	408,091	21,398
1954* . Upto August	142,374	94,618	236,982	152,230	102,460	254,960	23,657

*Hard Coke Produced at Steel Plants is not included in these figures as almost the entire quantity produced is consumed at their works and only a very negligible quantity is marketed.

It is understood that some of the existing plants are under repairs and the production is likely to be affected. Assuming that the Production of Hard Coke in 1955-56 is at the same level as at present, the production will fall short of the total demand.

Estimated Demand for Hard Coke during The Second Five Year Plan

The programme of the Second Five Year Plan is not yet finalised. But assuming that the programme envisaged a 20 per cent. increase in the production of the above industries the Hard Coke requirement including the present consumption will be about 7,00.000 tons.

Hard Coke Requirement of the Foundry Industry

Foundries are the most important consumers of Bye-Product Hard Coke. There are about 1,400 foundries big and small. The Association was able to collect replies from only 170 foundries. It is, therefore, not possible to give the exact requirement of the foundries. An idea of the estimated demand of the Foundry Industry may be had on the basis of the pig iron allocations.

The allocation of pig iron to the foundries during the last four years is reproduced to have been as follows:

1951	3,90,000	tons
1952	2,72,000	,,
1953	3,13,000	,,
1954 (January to June)	1,88,000	,,

If we take the latest figures for the first 6 months of the year 1954, the total allocation including the Tata Ingot Mould Scrap may be assumed at (1,88,000 × 2) = 3,76,000 tons during 1954. The actual supplies are always short of allocation. Assuming a 10 per cent. fall in the receipts, the total annual receipts of pig iron (including Tata Ingot Mould Scrap) would be about:

	3,76,000	tons		
Less	37,600	tons		
	3,38,400	or	3,40,000	tons.

No figures of allotment or availability of cast iron scrap are available. It is, however, estimated that the foundries use nearly the same quantity of scrap as Pig Iron. Thus the total consumption of pig iron and cast iron scrap may be taken at 6,80,000 tons. Assuming 70 per cent. as the yield, the finished product would amount to approximately 4,76,000 tons. It has been estimated that the consumption of hard coke is about 30 per cent. of the finished goods (in case of mehanite foundries the consumption is about 40·45% of the finished goods). The present Hard Coke requirement is, therefore, about 1,42,800 tons (30% of 4,76,000 tons).

According to a survey recently made, the Association understands that 60 per cent. of the capacity of the Foundry Industry is lying idle, for a number of reasons. Supposing there is some improvement in the situation during the First Five Year Plan period, the hard coke requirement of the foundries is bound to be higher. We can safely assume that by the end of the First Five Year Plan the requirement of B.P. Hard Coke will be increased by about 25 per cent. If this materialises, the requirement of B.P. Hard Coke of the foundries would be approximately 1,80,000 out of the total requirement of about 5,57,000 tons by 1955-56.

The Estimated Demand of the Foundry Industry during the Second Five Year Plan

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In the absence of any reliable data regarding the development programme of the Foundry Industry during the Second Five Year Plan, any estimate of Hard Coke requirement will be only indirect. The Association is of the considered opinion that as the industries develop during the Second Five Year Plan Period, the volume of work for the Foundry Industry will also increase proportionately. The Government policy will play an important role and local foundry industry will be called upon to do all kinds of casting which can be conveniently done in the country. Almost all the Cement, Sugar, Textile, Paper Mills have Foundry Sections attached to them. The normal repairs and replacements will be done by their casting departments. Already there are examples where the existing units have successfully manufactured all types of castings for setting up entire new plant. Government Import Policy will also play an important part in helping the foundry industry. The Railway Board have already taken the initiative and no Railway parts will be imported if they can be manufactured in the country. I, therefore, strongly feel that even though the picture of the foundry industry during the Second Five Year

Plan is not quite clear there is no doubt that the tempo of activity will be at least 25 per cent. more than what it is at the end of the First Five Year Plan.

The replies which the office has received reveal some interesting features. The smaller foundries consuming hard coke up to 200 tons per annum do not have any expansion programme worth mentioning. Rather, they do not have any idea of the future. They do not seem to be aware of the things to come. The Association feels that these foundries are too small to plan for the future. Their figures of consumption, therefore, do not represent the correct picture. Then there are foundries above this group and their present consumption is between 200 tons to 500 tons per annum. Some of these foundries do not envisage any expansion but the others envisage an increase in Hard Coke consumption by 10 to 15 per cent. consequent on the increase in their production. It is the foundries whose present consumption is 100 tons or above who seem to have definite expansion programmes and have estimated that their consumption by 1960 will be more than what it is in 1955. The percentage increase is widely varying. The increase in the demand of some of the foundries is given in Appendix 'A'.

Almost all the foundries are suffering from the shortage of Hard Coke. They require only Bye-Product Coke as beehive coke is unsuitable for casting purposes. Many of the foundries have complained that while the controlled price of Hard Coke is only Rs. 34/- per ton and including railway freight etc. the cost is Rs. 55/- per ton at Calcutta, it is offered at Rs. 145/- per ton in the markets. Some of the foundries in South India have complained that while controlled supply has been very inadequate and irregular for some time the Sea-borne coke is offered at Rs. 106/- per ton. Foundries in Western and North Western India have also made similar complaints. Serious complaints have been received about high pilferage of Hard Coke in transit. One foundry in Bombay complained that they lost 4 wagons of hard coke during the past 8 months. Perhaps it is such Hard Coke lost in transit which finds place in the black market, among other.

APPENDIX

Name	Present Demand (Tons)	Future Demand (Tons)
1. Mysore Iron & Steel Works, Bhadravati	25,000	40,000
2. Government Ordnance Factories	10,000	16,000
3. National Machinery Manufacturers Ltd., Kalwe, Thana, Bombay	1,350	10,000
4. Atta's Iron Foundry 171, G.T. Road Salkia, Howrah	1,800	10,000
5. Jay Engineering Works Ltd., 181-A, Prince Anwar Shah Road, Calcutta.	1,360	7,200
6. Textile Machinery Corpn. Ltd., Post Box No. 644, Calcutta.	1,044	3,300
7. Maya Engineering Works Ltd., 36-A, Russa Road, Calcutta-26	960	2,400
8. Cooper Engineering Ltd., Satara Road, Distt. Satara	1,600	2,400

Name	Present Demand (Tons)	Future Demand (Tons
9. Textool Co. Ltd., Coimbatore	1,075	2,200
10. India Piston Ltd., Madras-11	1,200	2,160
11. Port Engineering Works 8, Clive Row, Calcutta-1..	960	1,500
12. Richardson & Cruddas Ltd., Byculla Ironworks, Bombay-8	800	1,440
13. Texmaco (Gwalior) Ltd., Gwalior	1,000	1,200
14. Mohan Foundry Ltd.	600	1,200
15. Govt. Electric Factory, Bangalore	200	1,000
16. New Standard Engineering Co. Ltd., Carrel Road, Bombay -13	600	760
17. Binny Engineering Works Ltd., Post Box No. 1855, Madras	360	720
18. Saraji Iron & Engg. Co. Ltd., Ohhani Road, Baroda.	360	720
19. Jyoti Ltd., Baroda.	410	700
20. Arthur Butler & Co. Ltd., Muzaffarpur, Bihar.	400	600
21. Investa Machine Tools & Engg. Co., Ltd., Clerk Road Street, Bombay-11	150	600
22. Rampur Engineering, Co,, Ltd., Rampur- U. P.	110	600
23. Metro Malleable Manufacturers Ltd., Silver Jubilee Road, Bangalore	205	504
24. Praga Tools Corporation Ltd., Kabadiguda Road, Secunderabad-Dn.	160	500
25. Modern Engineering & Moulding Co., Ahmedabad.	290	420
26. Godrej Boyce Mfg. Co, Ltd Lalbaugh Parel, Bombay.	240	360
27. S. K. Mudaliar & Sons, Secunderabad	120	360
28. Mysore Machinery Manufacturers Ltd., Post Box No. 191 Bangalore	300	600
29. Dalmia Cement (Bharat) Ltd., Dalmiapuram	60	270
30. Vijay Steel & General Mills Ltd., Phagwara, Pepsu	70	250
31. Prakash Engineering Co. & Rolling Mills, Freeganj, Agra	120	240
32. Delhi Iron and Steel Co. Ltd., Grand Trunk Road, Ghaziabad	50	240
33. Peepul Iron & Steel Industries Ltd., Kanpur	45	200
34. Choday Approw Engineering Works, Post Box No. 8, Kakinada	100	250

III. A SURVEY OF HARD COKE REQUIREMENTS IN INDIA

(By Fuel Research Institute—January 1955)

Introduction

For some time past, there has been considerable shortage between the production and demand of hard coke in India, and this has been reflected in complaints from consumers, particularly the foundry product manufacturers. The situation became worse with the collapse of one of the batteries of Messrs. Lodna Coke Co. Ltd. and with the deterioration in the quality and output of coke from the other merchant ovens, including the Government Plant at Giridih. Most of these plants are more than 25 years old, and they require either thorough overhaul or complete rebuilding. The details of these coke-ovens (in 1952) were as follows:

TABLE 1.—*Particulars of the Coke Ovens*

Name of firm	Design of Oven	Width (in.)	Length (ft.)	Height (ft.)	Loading length (ft.)	Loading weight (tons)	Type	Condition of oven walls	Output per Retort (tons)	Total output (tons)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Bhowra Coke Co. Ltd.	Vertical	20·0	33·0	8·3	31·0	9·0	Waste-heat	Leakage	6·7	3300/month
Lodna Coke Co., Ltd.	Do.	19·5	35·0	8·0	34·0	8·5	Do.	Battery No. 1, no leakage. Battery No. 2, slight leakage.	6·4	87661/year
Loyabad Coke Co. Ltd.	Koppers vertical flue transeverse	19·5	34·0	7·5	6·5	8·0	Regenerative	Leakage	varies from 4·0 to 6·5	73522/year
Bararee Coke Co. Ltd.	Vertical with horizontal flues	17·3 to 18·5	37·4	8·5	36·0	10·0	Waste-heat	Do.	7·0	200/day
Giridih Coke Plant	Vertical fluid (Simon-Carves)	20·0	33·0	8·0	32·0	10·0 (approx)	Regenerative	Bad (24 yrs. old)	7·3	132/day

The Conditions since then have deteriorated seriously.

The details of the operating merchant ovens as given by the Chief Mining Engineer of the Ministry of Production are as follows:

TABLE 2.—*Production Capacity, Demand and Details of Operating Ovens*

Name of Plant	Grade of coal	Anticipated monthly output (tons)	Total number of Ovens and Actual number of Ovens working at present	Remarks.
1	2	3	4	5
Giridih Coke Plant .	Sel. A.	2,900	50 ovens	45 ovens are now in operation, and 5 have been shut down for repairs.
Bhowra Coke Plant	Sel. B.	3,200	Out of 25 ovens 20 are working at present.	There is no scheme of extension of the present battery at the moment. Output may increase with the progress of repairing works.
Lodna Coke Plant .	Sel. B. .	4,000	60 ovens, 30 are working at present	Col.'s No. 2 battery closed down due to two labour strikes. The battery is badly damaged and is not fit for working. The management has not yet decided whether to repair it or not.
Loyabad Coking & By-Product Recovery Plant	Sel. A. Sel. B.	7,000	40 ovens, 33 are working at present	Ovens are being repaired by stages, and when completed are expected to produce 7,000 tons.
Bararee Coke Plant .	Sel. A. & Sel. B.	3,250	35 ovens, 27 are now working.	8 Ovens are under repair and the work is not expected to finish before the end of the current year.
		20,350		

If the position of supply of coke required for industries other than iron and steel is unsatisfactory at present, it is likely to become considerably worse in future when the Second Five Year Plan is implemented. In fact, our analysis shows that the lack in production of hard coke will impede, and even restrict, further growth of many industries under the Second Five Year Plan based on this important raw material. Hard coke is required mainly for the foundry industry, producing cast-iron, wrought-iron, steel-castings, non-ferrous castings, for manufacture of ferro-manganese, soda-ash, carbide, and also lime and cement using the shaft-kiln process. Hard coke is also required for water-gas generation in chemical industries, for producer gas generation, for lean gas production, and for various other uses

In view of the strategic position of India in South-East Asia (where no coking coal is available) a considerable export market for hard coke can also be built up, provided that the right quality of hard coke is supplied and at competitive prices to other countries, such as South Africa and Australia. Considerable exports of hard coke are made by U.K. and Germany to the neighbouring non-coke producing countries in Europe. The advantage of exporting hard coke instead of coking coal is obvious from the fact that higher prices are obtained for coke than for coal (thus more foreign exchange), and the by-products are retained in the country for augmenting the chemical industries.

A Statistical Survey

However that may be, we present below a factual survey of our present position and an estimate of the future requirements.

There are over 1,700 large and small consumers of coke in the foundry industry in India, and there are many other consumers such as sugar industries, textile mills, chemical concerns whose demand are not easily ascertained. However, a questionnaire was prepared and issued to over 1,200 registered consumers. The list of consumers was obtained from the Indian Foundry Association. In addition, various organisations such as railways, glass and potteries associations, Coal Commissioner's organisation, etc. were separately addressed to assess the requirements of hard coke as available with the respective organisation. The replies received from these organisations are sketchy, and have not been included in this survey.

In view of the fact that only 350 firms cared to reply to the questionnaire, there was no other alternative but to adopt statistical method for assessing the present position and forecast the future demand. It will, however, be seen from Table 3 that our replies covered approximately 13,800 tons per month of by-product hard coke in the form of requirement or in other words 77 per cent. of the total production of by-product hard coke or 102 per cent. of the total of sized by-product hard coke produced in the country (on the assumption that the amount of production of coke over 2″ is about 75 per cent. of the overall production of coke—for details refer to Table 8).

TABLE 3.—*Position regarding requirement and allotment (based on replies of 351 firms)*

1. Requirement (ton/month)	13,767
2. Allotment (ton/month)	11,237
3. Percentage of Allotment to requirement	82 per cent.
4. Percentage of consumers requring by-product hard coke only	88 per cent.

The requirements, if judged in terms of total production of coke including Beehive coke, are 43 per cent. of the total; if only the total sized coke production is taken, our survey has covered 58 per cent. of the total production of the hard coke in the country. It will be seen, therefore, *that our survey is fairly representative of the present consuming sector, and it is therefore safe to make a statistical forecast on the basis of the replies received.*

An important fact brought out by the survey was that 90 per cent. of the consumers required only By-Product Hard Coke above 2″; approximately 50 per cent. required coke only over 4″ in size. These findings are in accordance with foundry practice. In Table 4, the size specifications of foundry coke for India are given.

TABLE 4.—*Size Specification for Foundry Coke in India*

Size	Per cent retaining
6″—8″	20
4″—6″	50
1½″—4″	30
Total	100

Specifications for foundry coke for various countries are given in Appendix V. It will be seen that Indian foundry coke is extremely poor in comparison to most countries.

Table 5 below shows the opinion of consumers regarding utility of By-Product, Beehive Coke:

TABLE 5.—*Opinion of the Consumers regarding the Utility of B.P. and Bee-hive Coke*

	No. of consumers	Percentage	
1. By-product Hard Coke	308	88	can utilize B. P. Hard Coke only.
. Behive Coke	43	12	are prepared to accept Beehive coke.
Total	351	100	

In view of the above, it will be wiser to neglect the production of Beehive coke from any survey of requirement, as only 12 per cent of consumers can utilise such coke. However, alternative calculations based both on the total production of hard coke and by-product hard coke only are given. Estimation of present demand and forecast of future demand of only sized coke above 2″ have been taken into consideration, as it is well-known that the coke below this size is of no use to the consumer, except for small smithies, gas producers etc. whose demand have not been taken into consideration.

The total production of hard coke of all sizes and qualities is given below. In the last two columns of the table the production of sized coke above 2″ and 4″ based on these production figures is also given. These percentage figures of sized coke are based on F.R.I. analyses.

TABLE 6.—*Present Position Regarding Demand and Production*

Size Range	Monthly Requirement Sizewise (on the assumption of percentages obtained in Table 8)	Monthly Production Sizewise (on the basis of per cent ages assumed)			% of production of sized coke to demand of sized coke	
		Bye-product	Beehive	Total	By-product % of (3) to (2)	Total % of (5) to(2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Below 2″ .	7,480 (17)	4,500 (25)	3,500 (25)	8,000 (25)	60	107
2″—4″ . .	13,200 (30)	2,700 (15)	2,100 (15)	4,800 (15)	21 } 37	36 } 66
Above 4″ .	23,320 (53)	10,800(60)	18,400 (60)	19,200 (60)	46	83
Total*	44,000 (100)	18,000 (100)	14,000 (100)	32,000 (100)	41%	73%

*Figures under "Total" are estimated by the C.M.E./RB.

N.B.—For calculating figures pertaining to sized coke (above 2″) the two groups, *e.g.* 2″—4″ and above 4″, have been combined.

It is therefore apparent from Table 6 that the present production of above 2″ coke covers 66% of the demand of sized coke above 2″, and in the case of sized coke above 4″ the production covers a larger percentage, *viz.* 82% of the demand. *In terms of by-product coke only, the production of sized coke forms only 37% to the demand of sized coke in the case of above 2″ coke, and only 46% in the case of above 4″ coke.*

QUALITY OF COKE

As regards the chemical and physical properties of coke few of the consumers were in a position to reply accurately. Table 7 classifies the answers in terms of "satisfactory", "unsatisfactory", and "uncertainty".

TABLE 7.—*Quality of Coke Supplied*

	Number	Percentage
1. Satisfactory	134	51
2. Unsatisfactory	66	25
3. Indefinite answers.	62	24
	262	100

It is evident that most consumers do not have facilities for testing and go by the producer's statement of quality.

It is, however, well-known that the coke quality in terms of fixed carbon, ash contents, phosphorus, ash fusion, point, is not always satisfactory. The Fuel Research Institute has repeatedly received complaints regarding low ash fusion point of coke produced by one of the major producing merchant ovens. High ash and low ash fusion range leads to jamming of cupolas and to inferior quality of the finished manufactured products.

Most of the Indian cokes have high phosphorus, and for those produced in the merchant ovens no particular care is taken to select coals with low phosphorus content as is done in the Steel Works. As a result of high phosphorus content of coke, many special castings, particularly steel castings, phosphobronze castings, carbide manufacture, ferro-manganese manufactured by electrolytic process, etc. cannot utilise the coke produced by merchant ovens.

SIZE OF COKE

The size of coke is a very important characteristic with which the consuming industries are concerned. Practically all the replies stated that their demand for coke was for size greater than 2". The table below shows an analysis of the percentagewise requirements for various sizes.

TABLE 8

Requirement of Hard Coke of various Sizes

Size of coke required	Percentage
Below 2"	17
2"—4"	30
Above 4"	53
	100

It will be seen from the attached table (*vide* Appendix IV) on the standard specifications of foundry coke of India that this size requirement is not just a whim of the consumers but conforms to the actual needs of the industries concerned.

The production of size of coke above 2″ whether in the Bee-hive or in the By-product hard coke-ovens does not amount to more than 75 per cent. and for plus 4″ not more than 60 per cent. of the total production. All figures for coke requirements have, therefore, been corrected to this production level, and the demands have been taken as they are only on the basis of plus 2″ size only. The total percentage of demand for below 2″ coke is only 10 per cent. of the total, and this too is only for plus 1″ size. The production of plus 1″ coke is of the order of 82 per cent. on an average.

From Table 6 *the total amount of coke of size above* 2″ *available to the industries is of the order of* 24,000 *tons per month at present and only forms* 55 *per cent. of the overall demand.* If by-product hard coke alone is considered, the percentage of production is only 31 per cent. of the overall demand.

We have observed in our survey that *there is a discrepancy between allotment of coke by the Coal Commissioner's Organisation and the actual supply.* It is clear that this "lag" in supply is not due to shortage of transport alone, but is mainly due to the fact that whereas the allotment is possibly based on the overall production of coke from a coke-oven, the actual supply is based only on the sized coke, as undersizes are not acceptable.

The discrepancy between the demand and the allotment (on the present basis) and also between allotment and actual supply also present an interesting study. From an examination of figures of requirement and allotment of coke of about 350 industrial firms which were included in our survey, it appeared that on an average only 82 per cent. of their requirement was allotted. Taking the amount allotted to be the same as the amount produced, this figure compares favourably with the C.M.E.'s estimate of the present requirement.

The ratio of allotment by the Coal Commissioner's to the registered requirement is the same as the ratio of production to requirement, and this ratio also happens to be the same as the ratio of production of sized coke (above 2″) to overall production, which is roughly 75 per cent.

An independent analysis of figures of requirement, allotment and supply of 15 firms of a fairly large size reported by Indian Foundry Association has also led to the same results. Allotment formed 77 per cent. of the requirement and the actual supply 62 per cent. of the requirement.

PRESENT SHORTAGE OF HARD COKE

Thus, independent estimations from 3 different sources confirms that even at present there is a shortage of approximately 40 to 45 per cent. of coke. The total shortage calculated on the basis of the registered demand and above ratios comes to (44,000—24,000) 20,000 tons of hard coke per month. For meeting the shortage of 20,000 tons of sized coke per month, approximately 27,000 tons of additional production of coke is required even now. In addition only about 51 per cent. of the consumers are satisfied with the quality of coke supplied to them.

FUTURE REQUIREMENTS OF HARD COKE

The next question that was analysed was the requirement of hard coke for the industries for the next 5 years. Statistical forecast on the basis of replies is given in Table 9.

TABLE 9

Present and Future Demands compared with present production

Year (1)	% of production to demand (from the F. R. I. Survey) (2)	% of production of sized coke above 2″ to demand (2)× 0·75 (3)	Consumers' demand (tons p.m.) on the basis of (2) present monthly production—32,000 tons (4)	Production required (tons p.m.) on the basis of (3) on the assumption that the demand is only of above 2″ coke (5)
1953-54	82	62	39,024	51,613
1957-58	58	44	55,172	72,727
1960	55	41	58,536	78,049

From the above it will appear that by 1957-58 the demand of hard coke will increase by 41 per cent. over the present (1953-54) and by 1960 the demand will be more than 50 per cent. over the present demand. In the light of the above table, it is interesting to compare the demand to the production from the survey conducted by the F.R.I. on the assumption that the production remains the same, *i.e.* at the present level. The situation will progressively deteriorate in subsequent years.

In 1957-58 the present production will form 58 per cent. of the total demand and by 1960 only 55 per cent. of the total demand.

If we further assess on the basis that only 75 per cent. of the overall production conforms to the standards laid down by the rate of production will be only 31 per cent. to overall coke production required and supplies of by-product coke only 17 per cent. Inversely, the production has to be increased to a level of about 3 times the present level in order to cope with the increased demands in 1960. Thus, the required monthly production in 1960 will be approximately 78,000 tons per month.

The total requirement of sized by-product hard coke by 1960 will therefore be approximatey 59,000 tons per month.

We can be fairly certain, however, that the present production of by-product hard coke cannot be maintained by 1960 unless extensive reconstruction is undertaken by the merchant ovens. As pointed out earlier, the merchant ovens are well over 30 years old, and the normal life of a coke-oven is not more than 15 years. Some of the ovens are even older than 35 years. It is known for certain that some of these (such as Giridih) will not be in operation by that time.

Under the Second Five Year Plan directives have been given for increasing the production of pig-iron, steel castings ferro-alloys, non-ferrous castings, etc. If the 2nd Five-Year Plan programme has to succeed, the hard coke production in India will have to be considerably increased to meet even the home requirements.

INDIRECT ASSESSMENTS

It is interesting to check the results arrived at by the Statistical Survey carried out by us by independent methods and indirect calculations.

The Table 10 gives the indirect calculations on the basis of pig-iron allotment at present, and the total feed-metal to the foundries. The requirements for non-ferrous metals are not available, and a lumpsum of 5,000 tons per month has been assumed. In addition, with the present programme of manufacture of pig-iron (from Indian Iron & Steel Co.,) and surplus off-grade pig-iron that will be available from the proposed Government Steel Plants have also been taken into consideration. Although with the off-grade pig-iron supply to the foundries approximately 100 per cent. scrap metals is used, it has been assumed that with the foundry pig-iron to be produced in future only 30 per cent. of scrap will be used. The other figures for requirement of hard coke have been collected from information available at the F.R.I. and from correspondence with prospective consumers.

TABLE 10

Estimated Requirement of Hard Coke in India, 1960

Name of Industry		Requirement (tons per month av.)	
Soda Ash		3,000	
Ferro-manganese		4,000	(May be double this figure)
Carbide		1,000	(May be considerably increased if coke of right quality is available).
Mysore Iron & Steel		3,500	
Lime and Cement		5,500	
Foundries :			
(*a*) Present	15,000	41,000	
(*b*) Added requirement of hard coke due to the availability of surplus pig-iron and scraps from new steel plants	26,000		
Other (inc. Non-ferrous, casting etc.)		5,000	
Export		5,000	total 68,000.

The detailed basis of calculations of this table is given in Appendix. Thus, by this independent method of assessment also requirement of hard coke by 1960 is assessed at 68,000 tons per month. The figure is likely to be higher as only a few major consumers have been taken into consideration.

APPENDIX

DEMAND FOR BY-PRODUCT HARD COKE

Number of Foundries in India :	1500 to 1700
1. Total capacity of Iron Foundries :	(Utilized 40% of capacity)
Pig Iron allotment at present	3,40,000
Scrap	3,40,000
Total	6,80,000

2. Capacity of Steel Foundries :

1954		1960	
16,775	tons	22,000	(Considerable increase expected. Planning Commission recommends a new 5000 ton/yr. Steel foundry).

3. Malleable Iron Foundries :

Capacity 3500 tons. Estimated demand : 15,000 tons.

4. Non-ferrous alloys and metal 1952 . (Coke requirements for these have not been included in the estimate given below).

Non-ferrous alloys	7,650
Aluminium ingots	3,565
Copper	6,079
Lead	1,132
Antimony	181

Brass & Copper	9,185
Aluminium Sheets	4,962
Lead Sheets	43·5
Zinc Sheets	18·65
Black Copper rods	6,544
Brass & Copper rods	732
Aluminium Wires	2,022
Aluminium foils	582
Brass, Copper & lead pipes	371

Future production of pig iron and scraps (1960)

	Tons per annum
(*a*) Additional production from Indian Iron & Steel Co.	5,14,800
(*b*) Surplus pig iron and scrap production from the proposed Govt. steel plants	15,60,000
	20,74,800

(It is assumed that the production of scrap will form 30 per cent. of the production of pig iron).

Feed metal requirement

Iron Foundry :			
	Present	6,80,000	
	Future	5,14,800	
	Total :	11,94,800	tons raw materials.
Steel Foundry :		22,000	
Malleable Iron Foundry :		7,500	(Half of the estimated demand only taken into account).
		12,24,300	
	Say,	12,20,000	tons (Feed metal).

By-product Hard Coke requirement

I. *Iron Steel and Malleable Iron Foundries (by 1960)*

at 1 : 0·5 ratio—6,10,000 tons/yr. (A) (Feed metal to coke ratio).

II. *Requirement for the manufacture of Ferro-manganese*	50,000 tons/yr.
Calcium carbide	10,000 „
Soda Ash	36,000 „
Lime Kilns (Shafts)	66,000 „
	1,62,000 tons/yr. (B)
*III. Export requirement	60,000 „ (C)
Total requirements (A+B+C)	8,32,000 tons/yr.**

N.B.—Requirement of coke for foundries is plus 2″ size. This size consists of 70 to 75 per cent of total yield of coke, *i.e.* 25% more coke has to be produced.

*Can be considerably increased.

**Apart from this, coke is required for many other uses, *e.g.* water gas and producer gas, potteries, glass works, chemical factories, educational and research institutions and foundries attached to works.

IV. Demand For By-Product Hard-Coke

(Assessment by the Government of West Bengal)

Number of Foundries in India . . . 1,500 to 1,700

(1) Total capacity of Iron Foundries . . . . . . 1,166,560 tons.

	Tons.	
Pig Iron allotment at present	340,000	
Scrap	340,000	
Total	680,000	**(Feed metal about 60 percent of capacity)**

(2) Capacity of Steel Foundries

1954	1960
16,775 tons.	22,000 tons **(Considerable increase expected. Planning Commission recommends a new 5,000 ton/year. steel foundry).**

(3) Malleable Iron Foundries—

Capacity—3,000 tons.

Estimated demand—15,000 tons.

4) **Non-ferrous alloys and metals coke requirements for these have not been included in the estimate given below) :—**

	Tons.
Non-ferrous alloys	7,650
Aluminium ingots	3,565
Copper	6,079
Lead	1,132
Antimony	181
Brass and copper	9,185
Aluminium sheets	4,962
Lead sheets	43·5
Zinc sheets	18·65
Black copper rods	6,544
Brass and copper rods	732
Aluminium wires	2,022
Aluminium foils	582
Brass, copper and lead pipes	371

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uture production of pig.—

Indian Iron & Steel Co.—1,200 tons/day plus 30 per cent scrap—360 tons =1,560 tons/day (feed metal for foundry), or 514,800 tons yearly.

Feed metal requirement—

Iron Foundry	Tons.	
Present	680,000	
Future (additional)	514,800	
Total	1,194,800	raw material.

Steel Foundry	22,000	
Malleable Iron Foundry	7,500	(Half of the estimated demand only taken into account).
	1,224,300	
Say,	1,220,000	(Feed metal).

By-product Hard Coke requirement—

I. Iron, Steel and Malleable Iron Foundries (by 1960) at 1 : 0·5 ratio (Feed metal to coke ratio)	610,000	ton/yr. (A)
II. *Requirement for the manufacture of* —		
Ferro-manganese	50,000	ton/yr.
Calcium carbide	10,000	,,
Soda Ash (Dalmiya)	19,800	,,
For Lime Kilns (Shafts)	66,000	,,
	145,800	,, (B)
*III. Export requirement	60,000	,, (C)
Total requirements. (A)+ (B)+ (C)	815,800**	

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*Can be considerably increased.

** Apart from these, coke is required for many other uses *e.g.*, water gas and producer gas, potteries, glass works, chemical factories, educational and research institutions and foundries attached to works.

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GIPD—L—45PC—25-10-55—1,000